WEDNESDAY, MARCH 26TH, 1902.

The Twenty-Seventh Annual General Meeting of the Society was held in the Linnean Hall, 23 Ithaca Road, Elizabeth Bay, on Wednesday evening, March 26th, 1902.

Mr. J. H. Maiden, F.L.S., &c., President, in the Chair.

The Minutes of the previous Annual General Meeting were read and confirmed.

The President delivered the Annual Address.

PRESIDENTIAL ADDRESS.

(Plate xliii.)

TABLE OF MATTERS.

Introductory.

On the occasion of the Twenty-seventh Annual General Meeting one is gratified to be able to report that during the past year the Society has fully maintained its activity.

Fourteen Ordinary Members and one Corresponding Member were elected; one Ordinary Member and one Associate Member resigned; and one Ordinary and one Corresponding Member died.

Dr. Charles Dagnall Clark practised his profession for a number of years at North Sydney, and died on 5th June last in the midst of his work, aged 45 years. He was an enthusiastic entomologist, especially interested in Lepidoptera, who became a Member of the Society in July, 1899. Among his professional brethren as in private life Dr. Clark was held in the highest esteem.

By the death of Professor Ralph Tate, F.L.S., F.G.S., on 20th September, 1901, the Society lost one of its oldest Corresponding Members. His first contribution to the Society's Proceedings is to be found in the second Volume (p. 290: read December, 1877). His last to the Society as well as to Science—"The Revised Census of the Marine Mollusca of Tasmania," prepared in collaboration with Mr. W. L. May, of Hobart—forms Part iii. of the Proceedings for 1901 recently issued; and was passing through the press at the time of his death. Professor Tate came out to Australia in 1875 as the first occupant of the

Elder Chair of Natural Science in the University of Adelaide; and thereafter actively laboured to advance a knowledge of the flora, fauna and geology, primarily of South Australia, but as leading up to the consideration of questions of an Australian or Australasian character. In addition to an extensive series of papers comprised in the twenty-five published volumes of the Transactions of the Royal Society of South Australia, Professor Tate also contributed others, at some time or other, to almost every scientific Society in Australia. Special mention may be made of his Presidential Address to the Biological Section of the Australian Association for the Advancement of Science, at the first Sydney Meeting of 1888, in which he proposed a threefold division of the endemic Australian Flora according to subregions. Also of his Presidential Address to the Association at the Adelaide Meeting of 1893, in which he treated of a Century's Geological Progress in Australia. Professor Tate was a member of the Horn Scientific Expedition to Central Australia in 1894; and an important contributor to the botanical, conchological and geological sections of the published results of that great undertaking. He was also the author of a "Handbook of the Flora of Extratropical South Australia," published in 1890. In a word, Professor Tate was a most worthy South Australian representative of the biological and geological veterans of the older States, whose numbers during the last decade or two have, in the ordinary course of nature, so sadly diminished.

In the early part of the year Mr. Cecil W. Darley, Mem. Inst. C.E., found it necessary to retire from the Council in consequence of his removal from Sydney to London. Apart from personal and professional qualifications Mr. Darley's wide experience and extensive knowledge in matters Australian, made him a very valuable member, and his resignation was received with much regret. Mr. James P. Hill, B.Sc., F.L.S., Sydney University, was elected to fill the vacancy.

In September last, to the regret of the Council, Mr. P. N. Trebeck found it necessary to resign the Hon. Treasurership, in consequence of his retirement from active business life. The

Council took an early opportunity of placing on record its appreciation of Mr. Trebeck's services to the Society as Hon. Treasurer during a period of nearly four years. Mr. J. R. Garland, M.A., was elected to succeed Mr. Trebeck, and assumed office on 5th September, 1901.

The names of the President, six Members of the Council, including the President, who this year retire in accordance with the Rules—namely, Professor David, Messrs. Deane, Garland, Hill, Maiden and Trebeck, and of the two Auditors—Messrs. Carson and Palmer,—but who are eligible for re-election, have already been communicated to you by circular.

Thirty-eight papers contributed during the year were accepted for publication. These have already been published and delivered, or are now in type. The 100th consecutively issued Part of the Proceedings, with twenty-one plates, completing Vol. xxv., was completed and distributed as far as possible on 20th May, 1901. Though no effort whatever was made to make this particular Part a special one, it will be conceded that its varied contents very creditably signalise the Century Number of the Proceedings. In addition to this Part, three Parts of the Proceedings for 1901 were issued before the close of the year, Part 3 being given up entirely to "The Revised Census of the Marine Mollusca of Tasmania," by the late Professor Tate and Mr. W. L May.

When completed it will be found that both in regard to the importance of the papers and to the illustrations, last year's Volume will take a good place in the now steadily growing series which the Society's publications make up.

With the acquisition of the late Sir William Macleay's legacy for the endowment of Bacteriological research, the Society, as an educational agency, entered upon a new phase of usefulness which has already had time to begin to bear visible fruit. During the three years (1899-1901) in which the Bacteriological Laboratory has been in working order, three pupils have received one or more courses of laboratory instruction—one in 1899; two in 1900, one of whom came from Adelaide for the purpose; and one in 1901. The three Volumes of the Society's Proceedings

for the years mentioned contain the Bacteriologist's contributions to knowledge These are not merely scientific papers published by the Society, but they are also the results of investigations carried out under the Society's auspices. These contributions now give Bacteriology a distinct *locus standi* in the Annual Volume. The work of Mr. Greig Smith, the Macleay Bacteriologist, during 1901, is referred to later on (p. 751).

1. Some Botanical Reminiscences of this Society.

In the very early days of its existence this Society was practically a zoological Society. In his second Presidential Address, delivered in January, 1876, Sir William Macleay remarked that it seemed to be rather anomalous that a Society named after the illustrious Linnæus should not have apparently a single working botanist among its members. But a little consideration will show that at this time Australian botanists, with the exception of Baron von Mueller, were merely undergoing a period of latency, pending the completion of the *Flora Australiensis*, the seventh and concluding volume of which did not make its appearance until the year 1878. Meanwhile, as long as this great work was in progress, it is obvious that Australian would-be working botanists could best advance the interests of science by assiduously collecting and sending their collections to Melbourne for consideration by Mr. Bentham and his collaborator, Baron von Mueller, rather than by attempting to deal with them themselves. Moreover, at this time, too, there was the prospect of a Supplementary Volume to be drawn up by Mr. Bentham; though eventually this was not carried out. There was, therefore, every reason why local botanists should stay their hands pending the conclusion of the great English systematist's labours. But in our time the pendulum has swung back. Instead of the botanical proceedings of this Society being confined to an exhibit or two, with an occasional paper, there is now no lack of interest in the botanical portion of the programme—a circumstance which continues to bode well for the advancement of this branch of science in New South Wales.

The first botanical paper to be met with in the Proceedings is a popular account of the Flora of Northern Queensland, by Mr. F. M. Bailey, which appeared in the second Volume (p. 276). A popular paper "On the Ferns of Queensland," from the same pen, appeared in the next Volume (p. 118). Another popular paper on the introduced Plants of Queensland will be found at p. 26 of the fourth Volume; and the first descriptive botanical paper, also by Mr. Bailey, "On a new Species of Fern, *Asplenium Prenticei*," at p. 36 of the same Volume. In the same Volume also the Rev. Tenison-Woods and Mr. Bailey write on the Brisbane Flora. In the fifth Volume the indefatigable Bailey has a paper on the "Medicinal Plants of Queensland," and another on two new Queensland Ferns. Tenison-Woods and Bailey write on the Fungi of New South Wales and Queensland; and the latter describes a new species of *Nepenthes*. In the fifth Volume also Baron von Mueller makes his début (p. 286) with Notes on the Flora of Mt. Dromedary; and this is followed (at p. 288) by Rev. Dr. Woolls' maiden paper on the "Eucalypts of the County of Cumberland." To the sixth Volume both Mr. O'Shanesy and Rev. B. Scortechini were contributors, so that by this time, under the influence of a completed *Flora Australiensis*, the ship of botany might be said to be now fairly launched. It will be seen what a prominent part Bailey took in the botanical work of our infant Society.

I knew the late Rev. Dr. Woolls well, and useful as some papers read before this Society are, I always feel that they do not do full justice to his botanical knowledge, on account of his great diffidence in expressing his opinions. He would freely and fully place his stores of information at the disposal of others, but rarely could he be persuaded to appear in print. He seldom, if ever, published a new species, although to others (almost invariably to Mueller), he would indicate what he deemed to be new and would leave the credit of publication to others. Mr. E. Haviland was another of the early botanical contributors to our Proceedings. He is still alive, though feeble from great age, and, like Woolls, he was very adverse to see his name in print. Though a good

systematist as regards Port Jackson plants, morphology and physiology were his forte. For years he and I spent our Saturdays together on botanical excursions, and I owe much to the fatherly way in which he imparted instruction. An instance of his diffidence in presenting statements is his reference to the stigma in *Boronia pinnata*,* Sm., in which he clearly indicated the rediscovery of Sieber's *B. floribunda*, which Mueller did not agree to until several years later.†

Woolls and Haviland were the two New South Wales botanists to whom our Society in its early days owed most, and their personal influence upon young members a decade and a half and more ago will long be felt with gratitude. Although not a botanist, the founder of this Society, the late Sir William Macleay, will ever be affectionately remembered by the older botanical members. He used to organise all-day Saturday excursions to interesting localities, always bearing in mind the wishes of botanists; and if the places were difficult of access, the cost of conveyance would be generously defrayed by himself, and usually he would insist on bringing a well-stocked hamper of provisions. He used to take great interest in our work, asking many questions, and when we made a find he was as happy as we were.

2.—Caley and Lewin.

I have recently been fortunate enough to find, in the Vienna herbarium, a number of Caley's Eucalypts bearing dates between the years 1805 and 1810, in most cases with the aboriginal names in Caley's handwriting. Of 55 specimens 54 are determinable. Robert Brown says‡:—"Mr. Caley has observed within the limits of the colony of Port Jackson nearly 50 species of Eucalyptus, most of which are distinguished, and have proper names applied to them, by the native inhabitants, who from differences

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* These Proceedings, vii., 397, 1882.

† 2nd Census Aust. Plants, p. 18, 1889; these Proceedings, xxi. p. 503, 1896

‡ *Collected Works*, Ray Society, i., p. 18.

in the colour, texture, and scaling of the bark, and in the ramification and general appearance of these trees, more readily distinguish them than botanists have as yet been able to do." I do not doubt that the names on the Vienna specimens are some of those referred to by Brown, and it is my intention to shortly publish them with their botanical equivalents, and some notes on Caley's career, in the *Agricultural Gazette* of New South Wales.

Through the kindness of the Hon. Phillip Gidley King, M.L.C., grandson of Governor King, I have been enabled to critically examine his fine collection of coloured drawings of New South Wales plants executed by I. W. Lewin from about 1805 to 1808 for Governor and Mrs. King. Little is known of Lewin, but he was of course a contemporary of Caley, and doubtless obtained some botanical assistance from the latter. They were shipmates on at least one occasion. Most of the drawings are of the indigenous vegetation of Port Jackson; a few are of weeds and other introduced plants. Botanical dissections are given in a number of instances. I have Mr. King's permission to publish my determinations, which I hope to do shortly. Besides these, Mr. King has two beautiful paintings by Lewin, really artistic productions. Both are on parchment (perhaps old drum-heads), each measuring 21 × 18 inches without the frames. One is the Waratah (*Telopea speciosissima*), and is signed "I. W. Lewin, Nov. 20th, 1805, New South Wales." The other is the Gigantic Lily (*Doryanthes excelsa*), and is signed "I. W. Lewin, A.L.S., New South Wales, June 19th, 1808." Surely we may include Lewin amongst the small band of those who diffused a knowledge of our flora during the early years of the nineteenth century. If he depicted a bird on a tree, a twig was usually so carefully drawn that the tree may be botanically determined. It is hoped that no efforts will be spared to collect all that is known of the work of this—the first Australian scientific artist. Following is information in regard to Lewin taken from the "Historical Records of New South Wales":—

Vol. iii., 358. The Duke of Portland writes to Governor Hunter, under date 6th February, 1798—"Mr. Lewin is a painter

and drawer in Natural History, and being desirous of pursuing his studies in a country which cannot fail to improve that branch of knowledge,* you will allow him the usual Government rations during his residence in the settlement."

Vol. iv., 308. Governor King to Lieutenant Grant, 5th March, 1801, instructing him to receive Caley on board the Brig commanded by the latter for the purpose of exploring the south-east coast. He adds—"I have also allowed Mr. Lewin to embark on board the Bee, for the purpose of collecting, to whom you will also afford such occasional assistance as may be in your power." (See also p. 356.)

Vol. iv., 417. Surgeon Harris to Governor King, from Hunter's River, 25th June, 1801. "Mr. Lewin also says he has met with new birds."

Vol. iv., 450, 451. Lieutenant-Colonel Paterson in his journal at Hunter's River speaks, under dates June 29th and July 8 (1801), of being accompanied by Mr. Lewin.

Vol. vi., 305. Deputy-Commissary Fitz writes to Under-Secretary Chapman, under date 15th October, 1807—"Lewin, the naturalist, is now collecting a box of seeds of the plants, etc., of the country, which I shall send to you by the earliest conveyance."

These extracts also show that Lewin was of some standing in the infant community.

Incidentally I may mention that the labels of the herbarium specimens of the early collectors, and the notes on sketches, etc., contain an imperfectly explored mine of information in regard to the movements of such collectors, the aboriginal and other vernacular names of plants, and of old place-names. To give but one example—the Editor of the *Historical Records* (N.S.W.), vi. 188, hazards the opinion that Caley was in Sydney as late as the

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* Cf. note g, J. J. Fletcher, Rept. *Austr. Ass. Adv. Science* (Melbourne, 1900), p. 87.

spring of 1808. I have a specimen collected by him as late as 5th February, 1810.

3.—Some Botanical Matters of Local Interest.

The starting of the International Scientific Catalogue in London last year will, as time rolls on, be of increasing interest to us in Australia. The Royal Society of New South Wales has undertaken the functions of a Regional Bureau, and a large number of slips have already been sent to London. As regards botanical matters, nearly the whole of the slips sent were of papers contributed to the Linnean Society of New South Wales.

The establishment of a new series of the *Botanisches Centralblatt* as the official organ of the International Association of Botanists became an accomplished fact at the new year, and a valuable and improved record or précis of work in all branches of botany is available to votaries of the science.

An important outcome of the International Congress of Botany held at the Paris Exhibition in 1900, and which I had the honour of attending, has been the appointment of an International Commission for the purpose of preparing resolutions and papers with a view to the unification of the principles regulating botanical nomenclature. I have been appointed a member of this Commission, and will in due course inform members of this Society of the steps that are proposed to be taken with the view to the settlement of this vexed question. The second meeting of the Congress will take place in Vienna in 1905.

During my term of office Mr. James Britten, of the Department of Botany of the British Museum, has placed us under great obligation by the publication of Part ii. of the "Illustrations of the Botany of Captain Cook's Voyage round the world on H.M.S. Endeavour in 1768-71." The plates are Nos. 101-243, and the originals were drawn under the direction of Banks and Solander. Apart from the special Australian value of this classic, the work is of interest to botanists everywhere, in that it depicts a number of plants not hitherto illustrated. Personally I wish that Mr. Britten could have adopted a different nomenclature in many

instances, especially as I doubt whether some of the changes he has sanctioned will ever receive general endorsement in this continent. But this is really a minor matter, and should not diminish our indebtedness to the Trustees of the British Museum, and to Mr. Britten for the service they have done in making these illustrations available to us.

The appearance of an important work by Webber on the fecundation of *Zamia** is of special interest to us in a country where *Cycadeæ* are so well developed. Spermatogenesis in plants (*Cycadeæ* and *Gingko*) was only announced in 1896 by the Japanese botanists Hirase and Ikeno, and Dr. Webber's work, begun in 1897, is rich in original matter, and contains a valuable bibliography. I do not doubt that our Australian physiologists will find his research full of inspiration.

The most serious loss to Australian botanical science during the year has been the death of Professor Ralph Tate of Adelaide, to whose life-work I have already alluded. He was one of the race of all-round naturalists, and achieved distinction in several branches of science. In botany he was a brilliant systematist of the conservative school, and Australian botany would have been richer but for the claims of other sciences on his time. His crisp dogmatism commanded attention, and if his statements appeared sometimes bold at first, they always secured respect, as his wide knowledge was willingly recognised. Personally I mourn a loyal friend and co-worker with whom I have been associated for many years, and I trust that his fine herbarium will be sacredly preserved, and that a South Australian will arise to continue his investigations on the flora of that State.

The Nestor of Australian botanists, Mr. F. M. Bailey, Government Botanist of Queensland, displays no flagging of his powers. During the year he has issued Part iv. of his excellent "Queensland Flora," including the orders *Hygrophyllaceæ* to *Eleagnaceæ*.

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* "Spermatogenesis and Fecundation of *Zamia*," by Herbert J. Webber. Bulletin No. 2 Bureau of Plant Industry, U.S. Dept. of Agriculture. (Issued December 28, 1901.)

This work does not prevent the publication of occasional papers on Queensland and New Guinea plants (sometimes describing new species) in the columns of the *Queensland Agricultural Journal*, and those who know the genial old veteran wish him still many years of useful service in making better known the marvellous botanical wealth of the northern State.

Mr. J. G. Luehmann, Curator of the National Herbarium of Victoria, is hard at work arranging the supplementary collections in that fine herbarium—solid, useful work that leaves him but little time for original research.

The Hobart Meeting of the Australasian Association for the Advancement of Science, held in January last, was not as botanical as usual, and were it not for Members of our Society there would have been no botanical contributions at all. There was a good gathering of Australian botanists who returned laden with specimens from Tasmania.

In our own Proceedings Mr. R. H. Cambage has continued his useful "Notes on the Botany of the Interior of New South Wales"; Mr. Watts has some records of Richmond River Hepatics; and Mr. D. McAlpine, of Melbourne, has a paper on the "Shot-hole Fungi of Stone-fruit." The Macleay Bacteriologist (Mr. R. Greig Smith) has contributed papers upon "The nature of the Bacteroids of the Leguminous Nodule and the Culture of *Rhizobium leguminosarum*," upon *Vibrio denitrificans*, and upon "Bacteria and the Disintegration of Cement." In the last paper it is shown that the decay occurring in the cement work of water canals and reservoirs cannot be traced, as has been suggested, to the action of certain bacteria, but to the chemical and physical action of the water upon inferior cement. In "The Gum Fermentation of Sugar-cane Juice" he described the isolation of *Bacillus levaniformans*, n.sp., which, in the manufacture and refining of cane sugar, causes a direct loss by the formation of gum, and an indirect loss by the gum retarding the crystallisation. The loss does not stop there, for the bacillus inverts the sugar in the juice, and also continues the degradation in the crystals after manufacture during storage and transit, as has been shown in

"The Deterioration of Raw and Refined Sugar Crystals in Bulk." The bacillus may also cause "The Acid Fermentation of Raw Sugar Crystals." The bacillus was found in sugar from widely distant lands, from beet as well as from cane sugar; and the Society is to be congratulated upon the fact that this universal and important agent, which entails so great a loss to a huge industry, has been discovered and investigated in its laboratory. Mr. Greig Smith is doing excellent work, and is justifying the sagacity of our founder who provided the means by which such researches are possible under the auspices of the Society.

4.—The Forestry Question in New South Wales.

A few months ago I delivered a lecture before our Royal Society on the "Forests of New South Wales,"* in which I gave some *facts* in regard to the trees and timber of this State. I now propose to follow up these facts with some *opinions* in regard to local forestry matters worth consideration. Although I have given attention to Australian forestry for many years, I have neither occult nor heroic remedies to apply at the present time, but every friend of the Forest Department will admit that its usefulness can be enhanced. First of all let us take stock of our forest reserves. Let them be accurately defined, and let those areas be rejected that are not required. It should be recognised that our country contains a large proportion of land unsuited to agricultural purposes;† much of this is available for forestry operations. It therefore seems equitable that the land suitable for crops and good pasture should, if held at all by a Forest Department, be held only until required for purposes of settlement.

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* *Agricultural Gazette of New South Wales*, July, 1901.

† As regards land actually utilised at present for agricultural purposes, see Coghlan, *Statistical Register* (1901), Part ix., Agriculture, &c. See figures in regard to areas cultivated under artificial grasses, under crops, &c. The grazing lands (ringbarked and non-ringbarked, and natural pastures) would be difficult to compute, except very approximately.

It has been decided to classify our forests, but no method will be satisfactory that is not based on the ecological principles referred to below at p. 776. We have not, however, full data at present to make a final classification of our forests; these will be secured as our botanical survey is pushed on.

I understand that the classification of the timber-bearing lands, so as to define their relative values for growth of timber and for agricultural purposes, has been proceeding, under the auspices of the Forest Department, for the past three years, and is to a large extent completed. To finish this work, and to settle the differences of opinion existing in many special instances between the Lands and Forest officials, will be the task, I understand, of the Commission of Experts that the Minister for Forests (Hon. Walter Bennett) has stated, in the press, it is his intention to appoint.

Then I would enunciate the axiom that we require to take stock of the trees upon the national property. What kinds have we? Where are they? Where do they flourish best? What is their state of maturity? For what purposes are the trees best suited? Can we answer all these questions? I fear not, and until we can do so much better than at present, I am afraid that our dealings with our forests will be based on empiricism. We ought to be in a position to inform an interested enquirer, at short notice, in what part of the country there is to be found timber best adapted for a certain purpose, and in what approximate quantity. Until we get this survey, which need not be minute, of our resources, I am afraid we shall not have a Forest Department which will command the full confidence of the country.

To avoid tedious reiteration, may I, at this place, be pardoned if I refer to some remarks addressed by me to our Royal Society in 1897;* I do not intend to repeat them.

This botanical survey of which I have spoken, will lead, by the quickest road, to an accurate knowledge of the properties of our timbers. There is no stimulus to enquiry more keen than that

* Journ. R. Soc. N S. Wales, xxxi., 62, 67, 68.

of pecuniary interest, and the commercial man will ascertain the value of a timber for his own purposes if he be given an opportunity. For all commercial purposes there must be (1) a sufficiency of the article; (2) continuity of supply. How can a man be assured of this except by a botanical survey? He sees a piece of timber and says—"This will do admirably for a certain purpose," or "If I had a large supply of this timber, I could utilise it at once." These statements have been made to me hundreds of times by Australians, and by visitors anxious to do business with us, but they have often been stopped at the threshold by my inability to answer the pertinent questions to which I have referred. I therefore would put the botanical survey (or whatever name one may choose to call it) amongst the very first of the duties to be undertaken by a Forest Department. Examination of our timbers can go steadily on even before a survey is made, but such examination must be fitful and incomplete until it receives the stimulus of the attention of users of timber and other commercial men actuated by self-interest. It is not for me who have, perhaps, been longer engaged in critical investigations concerning the identification, properties, and uses of our timbers than any other public servant in New South Wales, to depreciate scientific research, but I have experience of the many limitations of the scientific and technological investigator.

This country requires *conservation* of forests rather than plantations. It should be ascertained in what forest reserves young trees can be economically conserved, and reserves open to the timber-getter should be carefully cut over and then closed, if necessary, for a term of years. In European countries conservation, as opposed to planting, is more actively carried on than is usually supposed.

Intimately associated with the question of conservation is the necessity for the imposition of judicious limitations upon the ringbarker,—he who performs the operation recklessly, and in a wholesale manner, solely in the pastoral interest.

I would protect the forests at the heads of water-courses and in broken country generally. Much country of that character is of no use for agriculture, and its dedication for forestry purposes would not excite the cupidity of persons in search of land.

I have already hinted that planting as a source of timber should not be undertaken on a large scale in New South Wales. The initial cost of careful planting and protection of the young plants can only be justified in exceptional circumstances. Some well-meaning friends would urge us to establish plantations of soft-woods, *e.g.*, the Pines of the Baltic and North America, the Redwood of California, and so on, but our climatic conditions are so different to their native countries, that we cannot hope to compete commercially in the production of such timbers. Ours is a country that naturally produces hardwood, and it seems to me that we should promote the growth of the best of those, and rely upon the competition of trade to supply us with soft-woods in exchange. Of course, if expenditure of money be no object, we can establish plantations of soft-woods, but to secure this we may require to utilise land adapted to agricultural purposes, and to expend funds on nursing plants for which the commercial returns will be altogether inadequate. In a country such as ours, in which the functions of government are so extensive, it is sometimes desirable to ask oneself the question, "Would I incur this expenditure on private account?" I am referring now to the question of the cultivation of soft-woods. But I would certainly make experimental plantations of Silky Oak (*Grevillea robusta*) in some of the drier districts which experience has already shown suitable to it, and the Red Cedar (*Cedrela australis*) should be judiciously re-planted in country from which it has been well-nigh exterminated.

Of far greater importance than actual planting operations by the Forest Department would be the education of our citizens in tree-planting. It must be remembered that our people are not a race of tree-planters, and many of them to whom trees would be of the greatest advantage for shade, shelter belts and other

purposes, have no intelligent idea of planting. Hence they waste money and time and then draw conclusions that it is useless to proceed further. We have many difficulties in regard to our climate, but some are surmountable by properly directed energy. I am of opinion that practical demonstrations in the country districts by skilled tree-planters from the Forestry Department on "How and when to plant a tree and how to care for it when planted," would be the means of causing trees to be planted where they are most wanted, and where they would be most cared for. Such plantations would neither be a source of anxiety nor expense to the State, though of great advantage to her citizens.

The planting of trees in the Western plains is a question that must receive serious attention at an early date. It is one that should be undertaken or supervised by the Forestry Department, a sub-branch of which should be responsible for plantations in the arid west, the conditions being special. The object of tree growing in such districts is not entirely for conversion into timber—perhaps such an object is a subordinate one—but a very important result would be the amelioration of the condition of the residents in that trying climate. That being so, success is not to be measured by the Treasury receipts from such forests. As I believe that the desirability of tree planting in the Western plains is not open to question, I have only to add that, in my opinion, the work should be carried on from local State nurseries, which should be attached to the existing Experiment farms at Coolabah, Pera Bore (Bourke), and Moree. I would also have a nursery at, say, Hay. In this way the trees would be grown under conditions approximating to those they would have to grow in. At present plants for the arid West are raised in nurseries in the coast belt, with an annual rainfall of from 30 to 50 inches; besides which they have to travel hundreds of miles to their destination. The results are frequently disastrous as far as the establishment of sturdy trees is concerned; it would be a matter for surprise if it were otherwise.

If one's knowledge of Australian forestry were confined to what one sees in letters to the newspapers, one would imagine

that its sole object is the furnishing of timber to the saw-miller. That is but one object, albeit an important one, other phases of forestry being the combating of drift sand (alluded to below), planting for the mitigation of floods, the up-keep of river banks, the planting of shelter-belts, and so on. The forester has as much right to claim credit in the national balance sheet for improvements such as these as from the revenue arising from timber royalties. The recently published Report of the Western Lands Commission has vividly brought home to us the fact that dealing with sand-drifts is not a coastal question confined to Sydney and Newcastle, but one of magnitude to the far West, and one that must be coped with in the near future unless we are prepared to abandon large areas of pastoral country. The question of dealing with drift sand belongs properly to a Forest Department, and it is of such great local importance to both east and west of our State that I would not continue to leave it be dealt with in a desultory manner, but would make a sub-branch of the Forestry Department responsible for this service.

It has been suggested that, as soon as possible, a highly trained forester from Europe or India should be appointed to take charge of our forests. My own view of this suggestion is that it is a plausible one, but that it should not be looked upon as a panacea for what is admittedly an unsatisfactory state of affairs. In the first place, if we were to bring a man accustomed to treat forests with despotism tempered by benevolence into New South Wales, which possesses one of the most democratic governments in the world, and which spirit of government has been largely applied to our forests, what would be a foregone conclusion? If he were a firm man he would come into collision with vested interests immediately; if he were a weak one, he would speedily lose heart in contemplation of the impossible task set him; in either case, in my opinion, the experiment would be doomed to failure. Then again, our forests are mainly those of Eucalypts, one of the most difficult groups of plants in the universe, and a stranger must be a few years before he can obtain a knowledge of them sufficiently intimate for the purposes of the conservator. My view, more

than once expressed, is that our peculiar conditions necessitate the setting up of a specially adapted system of Australian forestry, for I know of no country whose methods can safely be transplanted without much alteration. Of course the personal equation in forestry is an important one—there may be a man whose experience and whose personality would enable him to successfully deal with our forest questions from the start, but he has to be found. I think we should first set our house in order, obtain a temperate Forest Act, the passing of which can only be secured by a spirit of compromise, obtain knowledge of our own forest lands and of the timbers upon them; all these things can be done with sufficient thoroughness in from three to five years, by which time I do not doubt that the Minister in charge of Forests will be able to offer the post of Acting Conservator to a man with special qualifications. We have made so many mistakes in the past in dealing with our forests that I venture, thus imperfectly, to outline a policy which I submit is sound, and which is certainly safe.

From my remarks it will be observed that my view of the operation and responsibilities of a Forest Department is that they have a much wider scope than is usually attributed to them.

There is no doubt whatever in my mind that an ideal arrangement would be the consolidation of all forestry work and interests in one compact department, under the administration of a sympathetic Minister of the Crown whose attention should be solely occupied with the welfare of this great national property, the forests of New South Wales, and the undertaking of the other important duties which I have indicated as coming within the purview of a modern forestry system.

As a public servant I have my limitations of speech, but I think it is my duty, as your President, and speaking as I do to a body of scientific men, many of whom have given much attention to phases of the forestry question, to ask you to strengthen the hands of the Government in their efforts to deal scientifically with a congeries of knotty scientific problems.

Owing to the enlightened policy of the Hon. William Patrick Crick, Minister for Lands, who first gave me authorization, and the Hon. Walter Bennett, Minister for Forestry, who has continued his support, I have made considerable headway with quarto illustrations of the forest flora of New South Wales. It is my desire to depict every tree in the State, and the beautiful illustrations from Miss Flockton's pencil can now be reproduced at a cheap rate as soon as it is desired to prepare the work for publication. Previous enterprises of this sort have resulted in financial failure through the cost of reproduction, an error I am determined shall not be repeated in the present case. Of this I am certain, that a work like this would give an impetus to the study of botany and forestry in this State, and also that the moderate sum expended upon it will receive the unanimous approval of all who are interested in diffusing a knowledge of the trees of New South Wales It will also convince the public that the Forest Department is now alive to a very obvious duty.

While glad of the opportunity of being able to carry out the work I have just indicated, I hope at the proper time to suggest the issue of another work of undoubted practical value. I refer to a book of photographic reproductions of the forests of New South Wales, depicting not only characteristic individual trees, but also typical forest scenes. The growth and variation of the same species in different localities and under different conditions could be shown, and if the subjects were carefully selected and judiciously described, such a work would be of immense value in advertising and creating an intelligent interest in our forest resources. Knowledge of our forests is possessed by a very small percentage of the community, and I am confident that suitable pictorial illustration would be a potent factor in dispersing that ignorance.

5.—Botanical Survey of New South Wales.

i. *A botanical map* (Plate xliii.).

a. Introductory.

Reverting (*supra*, p. 753) to my suggestion for a botanical survey, I may state that during the five years that have elapsed

since those words were uttered, I have received not a few expressions of opinion from those who approve of the idea. Other duties have hitherto prevented me from making definite suggestions with the view of mapping out the State into botanical provinces, but what I now submit may be of service as a basis for work. It is impossible to construct a complete botanical map while there is so much botanically unexplored country, and what I have indicated is really a scheme for systematic botanical exploration.

Our State is divided into counties which, in many cases, have artificial boundaries. They will, however, be useful, to some extent, for the purpose of giving definiteness to some of our proposed botanical areas. New South Wales is also divided into three roughly parallel portions for the purpose of Land Administration, the boundaries being an attempt to define the lands in accordance with their climatic and settlement values. It is very difficult to divide New South Wales into natural physical divisions of any kind, as anyone who has made the attempt has readily discovered.

I have tried to divide the State into botanical districts on climatic data, but have found many difficulties. Mr. H. C. Russell, our Government Astronomer, has published maps showing, in square degrees, (1) the average rain, (2) the average monthly rainfall, (3) the spring, summer, autumn, and winter mean temperatures, and the highest and lowest temperatures, (4) the average temperature for each month in the year, but I have only been able, in a very general way, to use these data for botanical purposes.

The late Mr. R. D. Fitzgerald* made the first attempt with which I am acquainted to divide New South Wales in accordance with its botanical features. His classification is as follows, but, it will be observed, it is but slight.†

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* *Linn. Soc., Lond.* (1882): Abstract in *Journ. Bot.*, xx., 96.

† The paper of Prof. Ralph Tate "On the influence of physiographic changes in the distribution of life in Australia" (*Proc. Aust. Assoc. Adv. Sci.* i. 312, 1888), should be referred to. He discusses the flora of the whole of the continent, dividing it mainly into three groups, and deals with general considerations.

1. That of the sandstone, or poor country, represented by the *Proteaceæ*, *Epacrideæ*, and *Xanthorrhœa*.
2. Eastern slopes of coast range represented by *Urticeæ* and *Palmeæ*.
3. Cold mountain lands represented by *Doryphora*, *Filices*, and *Myrtaceæ*.
4. Interior plains represented by *Chenopodiaceæ* and *Compositæ*.

I now proceed to lay before you a tentative scheme for the division of New South Wales into botanical "counties." It will be seen that various considerations have weighed with me in suggesting their limits. I do not doubt that my map, imperfect as it is, will give definiteness to criticism, and the eventual outcome will be that we shall have a botanical map of scientific and practical value.

I have used the term botanical "county" because a similar term has been used for somewhat similar botanical areas in Great Britain and Ireland. Most of the areas I have called counties are larger than the European ones. There is, however, the objection to this term, that it is liable to be confused with the political or municipal divisions called "counties." For a similar reason M. Flahault* substitutes "domaine" for the "province" of Engler. It is not likely that names for phytogeographic divisions will be generally agreed upon except as the result of an international conference. M. Flahault's paper* makes suggestions in regard to the nomenclature of botanical areas, as follows :—

GROUPE DE REGIONS.
REGION (Martius 1831).
DOMAINE.
Secteur.
DISTRICT (Bezirk, Engler, 1879).
SOUS-DISTRICT.
Station (Wimmer, 1844).

* Projet de nomenclature phytogéographique. *Proc. Congr. Int. de Botanique*, Paris, 1900.

Examples of this classification are given as follows :—

Région.—(1) "Région forestière de l'Europe occidental."

(2) "Région mediterranéenne."

Domaine.—Région (1) "Un domaine atlantique, un domaine des plaines du Nord continental Européen, un domaine du centre de l'Europe."

Région (2) "Domaines ibérique, Mauritanien, français, etc."

Secteur.—The "Domain atlantique" includes "Un secteur *aquitanien*, où les espèces immigrées de la région Méditerranéenne sont nombreuses, et un secteur *armoricain* où elles manquent."

District.—"Dans le domaine français de la région méditerranéenne, *le district* calcaire des basses Corbières, *les districts* des maurès et de l'Esterel formé de roches éruptives siliceuses. Les Baléares, avec leurs nombreuses espèces endémiques, constituent un district très distinct dans le secteur occidental du domaine ibérique."

From this it is clearly seen that the grouping of land-areas even in Europe contains the elements of indefiniteness and of expediency; as our country becomes better known botanically we shall be able to define it better, but New South Wales will certainly be found to be more uniform in its vegetation (and therefore more difficult to split up into divisions), than western and central Europe. We have much of the continental climate and uniformity of Russia.

It will also be seen that the divisions "Domaine," "Secteur" and "District" are, in the present state of our knowledge, only of partial application to New South Wales, unless we attempt much subdivision. I feel more and more strongly that we have so much pioneering work to do in connection with our botanical survey that we cannot at present adhere very closely to European precedents in regard to the subdivision of botanical areas. C. B. Clarke* has divided British India into botanical areas. He says, "British India having been treated as a Subarea of the

*On the Subsubareas of British India, illustrated by the detailed distribution of the Cyperaceæ in that Empire. *Journ. Linn. Soc. Bot.* xxxiv. 1.

Indo-Chinese Area,* the present paper attempts to divide into a convenient number (11) of Subsubareas for botanical reference." He has tabulated the Indian *Cyperaceæ* on this framework and says, "Only by a somewhat full trial can the convenience of a scheme of subsubareas be tested; moreover, it affords an opportunity for the suggestion of improvements in the scheme of subsubareas proposed." It is observed that the divisions are only tentative, as indeed they must be more or less, until tested by practical use. The employment of a definite group of plants (a Natural Order) to test the utility of the divisions, seems novel, and the precedent should be followed in New South Wales. The term "subsubarea" of Clarke appears to correspond to Flahault's "domaine" rather than to his "secteur," and affords another instance of the desirability of uniform nomenclature. Nevertheless, if botanists divide the different counties with which they are familiar into botanical areas as their local knowledge or predilection dictates, the mere fact of their working on definite lines, no matter how they differ in details, will result in the accumulation of valuable facts which will be capable of utilisation in the grand scheme of international classification of botanical areas which is foreshadowed in the early future.

"Could we but know the actual curving boundaries of a few hundreds of our best-defined species, what a wealth of new generalizations could be drawn from them, and how much new information they would yield concerning the factors which govern distribution in general!

"For, irregular as these lines would be, I can but think that they would in many cases stand in definite relation to lines of other kinds, to isothermals, to altitudinal contours, to degrees of humidity, to the boundaries of geological formations, the limits of glaciation, the ranges of animals, especially pollen-bearing insects, to the paths of bird-migration, and finally to the course of human traffic."†

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* *Phil. Trans.* Vol. 183. B (1892), p. 371.

† Dr. B. L. Robinson's Presidential Address to the Botanical Society of America. "*Science*," Vol. xiv. No. 352 (1901).

Our results may, for many years, prevent us from affording satisfactory information in regard to a number of these points, but they are ideals, and should be striven after.

I show you to-night a "curving boundary" of one of our important species. This idea of graphic representation of range of species occurred to me many years ago, and I have had it in limited use for two or three years. It may proceed simultaneously with the main botanical map, and is, in fact, supplementary to it.

b. Topography (Plate xliii.).

EASTERN COUNTIES.

E1. Monaro County.

This consists of the well known tableland of the Monaro, and is bounded on the east by the Dividing Range, on the south by the Victorian Border, on the west by the Snowy Range (Mt. Kosciusko to Kiandra), and on the north by the Micelago Creek. It comprises the counties of Wallace, Wellesley, and Beresford.

E2. South Coast County.

While this district is commonly known as the "South Coast," the term "South Coast Range" should perhaps be added to it. It comprises the counties of Auckland, Dampier, St. Vincent, and Camden (exclusive of Illawarra and of that portion west and north-west of the railway line between Marulan and Mittagong).

E3. Illawarra County.

For botanical purposes I would define its boundaries as—east, the ocean; west, the Illawarra Range; north, the Cordeaux River; and south, the Coast Range.

As thus defined the Illawarra is a fairly definite botanical area. The South Coast and North Coast Counties include many portions of brush country very similar to that of the Illawarra. Different people, however, define the Illawarra differently.

McFarland in his "Illawarra and Monaro" (Sydney, 1872), defines the Illawarra as extending from Bulli to the Shoalhaven, and lying between the Pacific and the Coast Range; it is about

55 miles in length as the crow flies, and its width is from half a mile to ten miles. He has a footnote—"The lands that lie to the south of the Shoalhaven River are sometimes included under the term 'Illawarra'; but they are different in scenery, soil, and principal products from those on the north."

E4. Cumberland County.

This is the political county of the name, and includes the country in the neighbourhood of the capital (Sydney). It is practical and convenient to the majority of New South Wales botanists to retain this as a botanical division.

E5. Blue Mountains County.

This comprises the county of Cook, and is a well-defined area of sandstone mountains, including a few isolated volcanic mountain tops. The sandstone is chiefly Hawkesbury Sandstone.

E6. Hunter Valley County.

It comprises the counties of Northumberland, Durham, and Brisbane (east of Great Northern Railway).

It is largely sandstone, and of comparatively low altitude. The sandstone is chiefly Carboniferous, though that in the southern part is Permo-Carboniferous. To the north it is rather dry.

E7. North Coast County.

It comprises the counties of Gloucester, Macquarie, Dudley, Raleigh, Fitzroy, Clarence, Richmond, and Rous (between the Richmond River and the coast).

E8. Upper Richmond and Clarence County.

It consists mainly of elevated plains and slopes, and is grazing country for the most part. It is intermediate in character between New England and the coast. It comprises the counties of Gresham (eastern half), Drake, Buller, and Rous (West of Richmond River). This county is partly inclusive of the Upper Richmond River district as defined in W. S. Campbell's paper in *Agric. Gazette*, p. 416 (1899), with map.

E9. New England County.

This consists of the following counties:—Arrawatta (eastern half), Clive, Gough, Gresham (western half), Clarke, Hardinge, Sandon, Inglis (eastern half), Vernon, and Hawes.

Its boundaries are:—North, the Queensland border; east, the steep escarpment; south, the Liverpool Range; and west, the Liverpool Plains.

It has an average elevation of say 2,500 to 3,000 feet.

Different authorities vary in their definitions of New England. Mr. T. W. Connolly, the District Surveyor of Armidale, has kindly favoured me with the following note on the subject:—

"This district should be strictly regarded as being identical with the old pastoral district of that name, but the name has been adopted for a mining district which does not quite coincide with the pastoral district.

"Locally it has a more restricted meaning, and an attempt is made to apply it solely to the high lands. The escarpment on the east is not easily defined, as it follows gullies breaking into and forming precipitous falls so irregular that definition would be a laborious task."

E10. Liverpool Range County.

This connects the Hunter River county with the western country.

It comprises the counties of Bligh, Brisbane (eastern portion), Hunter and Phillip. It is one of the intermediate, or "stepping-stone" counties.

E11. Southern Tableland County.

Average elevation say 2,200 feet, and consequently somewhat lower than the northern tableland (New England). An indefinite or intermediate county shading on the west into the plains country, and on the east into the coast country. The Great Dividing Range runs through it in a south to north direction. Northern boundary, Cudgegong River; eastern, Blue Mountains and South Coast counties; south, Monaro; west, western boundary of Selwyn, thence northerly along the Central-Eastern Land Division boundary to Gundagai, thence along the Murrumbidgee

to Yass, thence along the Boorowa River to Cowra and northerly to Orange, thence along the north-eastern boundary of Ashburnham, and thence along the Bell River to Wellington.

CENTRAL COUNTIES.

C1. Wagga-Forbes-Dubbo County.

This is another of the intermediate counties. It connects the tableland with the western plains.

Its boundaries are:—East, southern tableland and Liverpool Range county; north, Liverpool Plains; west, conventional lines joining Coonamble to Dubbo, Dubbo to Narrandera, and Narrandera to Corowa [a more correct boundary would be a somewhat sinuous line betwecn Narrandera, Forbes and Dubbo]; south, Murray River.

C2. Liverpool Plains County.

I would define it as including the counties of Darling, Nandewar, Jamison (eastern half), Baradine (eastern half), White, Pottinger, Buckland, Parry, and the western half of Inglis. Bounded on the east by New England; on the west it tapers off into the sterile sandy country, and is bounded by a conventional line from Coonamble to Bogabilla; on the south by the Liverpool Range. Mean elevation say 900 feet.

C3. Macintyre-Gwydir County.

It includes the upper waters of the Macintyre and Gwydir.

It slopes from New England to the west, where it joins the sandy or sterile plains, being bounded by the conventional line from Coonamble to Bogabilla. It is a county corresponding in some respects (though drier) to the Upper Richmond-Clarence county on the east. The floras of C3 and E8 are somewhat different. C3 tones off into W4, while E8 tones off into E7.

WESTERN COUNTIES.

Western Plains.

The western plains comprise the greater portion of New South Wales, extending from north to south. There is considerable

uniformity in the flora, but, chiefly because of its vast area, I have endeavoured to break it up, mainly on geological lines. The Murray-Murrumbidgee county is submitted as a fairly well defined botanical area, and the three other divisions are given with the view of ascertaining if they are a guide to the flora upon them. Certainly, as one crosses the Darling from the direction of Bourke, the vegetation is different, and we encounter sand-ridges and salt-lakes, but these are not confined to the Cretaceous, nor indeed to the trans-Darling country, as they are to be found east of the Darling in the Cainozoic country.

It seems desirable that such an unwieldy area should be broken down into convenient portions, if possible, and, if study of the areas I have suggested shows that they have no practical utility far botanical purposes, it may result in better divisions being indicated.

W1. Murray Redgum County.

This consists of the country enclosed between the rivers Murray and Murrumbidgee, and is bounded on the east by a conventional line joining Corowa and Narrandera. It includes the area liable to be flooded, comprising the valuable Murray Red Gum (*Euc. rostrata*) flats; much country similar in character occurs between the Murray and the Murrumbidgee. It has better soil than the other three western counties, and has much less mallee scrub.

W2. Cainozoic County.

So called because the area is mainly Cainozoic according to the geological map of the New South Wales Geological Survey.

The proposed boundaries are:—On the west, South Australia; north, 31st parallel to the Darling River at Myall in the east, thence south-easterly in a conventional line between the Myall and Condobolin, and intersecting the conventional line between Narrandera-Dubbo line referred to; south, the rivers Murrumbidgee and Murray.

In the "key" of the N.S.W. geological map, the Cainozoic area is defined as "Chiefly Pleistocene, with areas of red clay,

rounded quartz pebble drift of probably Pliocene age, and deposits of black flood loam of recent origin."

W3. West Silurian County.

This consists of the Western Plains, in which Silurian rocks predominate. See the geological map already quoted.

Bounded by the Cretaceous and Cainozoic counties, and south-east by a conventional line that joins Narrandera and Dubbo.

W4. Cretaceous County.

It consists of Lower Cretaceous areas, with a few patches of Upper Cretaceous or Desert Sandstone. See the geological map already referred to.

The boundaries are Queensland on the north and South Australia on the west; and, on the south, parallel 31° and the Darling and Macquarie Rivers; on the east, a conventional line from Dubbo north to Coonamble and thence north-west to Boggabilla.

This subdivision, if tested, will at least prove if the Cretaceous has any special flora.

c.—Botanical Records arranged Topographically.

I submit a number of readily accessible papers arranged for the purposes of a botanical survey. I do not suggest that the list is exhaustive; one of our young members might readily make it so. Publications of this character might suitably be published in a separate series, after the fashion of the "Records of the Botanical Survey of India."

E1. Monaro County.

Maiden, J. H.—A List of Plants collected by Mr. Richard Helms in the Australian Alps. February, 1893. *Agric. Gazette, N.S.W.* v. 836.

——— —The Flora of Mt. Kosciusko. *Ib.* ix. 720.

——— —A Second Contribution towards a Flora of Mt. Kosciusko. *Ib.* x. 1001.

E2. South Coast County.

MAIDEN, J. H.—Notes on the Geographical Distribution of some New South Wales Plants. S. Coast. *These Proceedings* (2), iv. 107.

E4. Cumberland County.

WOOLLS, W.—Plants indigenous and naturalised in the neighbourhood of Sydney. Govt. Printer, Sydney. 1st Ed. 1880: 2nd Ed. 1891.

——— —Eucalypts of the County of Cumberland. *These Proceedings*, v. 288, 448, 463, 488, 503.

——— —Botany of the Parramatta District; Woods of the Parramatta District. *Contrib. to Flora of Australia* (1867), pp. 1, 89.

——— —List of Parramatta Ferns, etc. *Lectures on the Vegetable Kingdom*, 1879, p. 214.

E5. Blue Mountains County.

CUNNINGHAM, A.—On the Botany of the Blue Mountains. Barron Field's *Memoirs on N.S.W.* (1825), p. 323.

WOOLLS, W.—Kurrajong and Tomah. *Contrib. to Flora of Australia* (1867), p. 173.

TREBECK, P. N.—Mt. Wilson and its Ferns. *These Proceedings* (2), i. 491.

WOOLLS, W.—A Glance at the Flora of Mt. Wilson. *These Proceedings* (2), ii. 6.

HAMILTON, A. G.—On the Flora of Mt. Wilson. *These Proceedings*, xxv. 346.

E6. Hunter Valley County.

WOOLLS, W.—Botany of Ash Island. *Contrib. to Flora of Australia* (1867), p. 184.

E7. North Coast County.

RUDDER, A.—Forest Wealth of Gloucester. *Agric. Gazette N.S.W.* vi. 383.

MAIDEN, J. H.—Notes on a Trip to the North Central Coast Forests of New South Wales. *Agric. Gazette, N.S. W.* vi. 583.

——— —Mount Seaview and the Way thither. *Agric. Gazette N.S.W.* ix. 577.

——— —Notes on a Trip to Mount Seaview, Upper Hastings River. *These Proceedings*, xxiii. 20.

——— The Don Dorrigo Forest Reserve. *Agric. Gazette N.S.W.* 1894, pp. 218, 519.

E9. New England County.

CHRISTIE, W.—The Forest Vegetation of Central and Northern New England in connection with Geological Influences. *Journ. Roy. Soc. N.S. W.* xi. 21.

MAIDEN, J. H.—Notes on some Eucalypts of the New England Tableland. *Report A.A.A.S.* vii. (Sydney), 537.

TURNER, F.—The Flora of New England, N.S.W. (Abstract). *Report A.A.A.S.* viii. (Melb.), 275.

E10. Liverpool Range County.

BAKER, R. T.—Botany of Rylstone and the Goulburn River District. *These Proceedings*, 1896, 427.

HAMILTON, A. G.—A List of the Indigenous Plants of the Mudgee District. *These Proceedings* (2), ii. 259.

E11. Southern Tableland County.

WOOLLS, W.—Botany of Berrima and Mittagong. *Contrib. to Flora of Australia* (1867), p. 101.

MAIDEN, J. H.—Concerning Hill Top. *Agric. Gazette N.S.W.* vii. 263.

——— —A List of Plants collected in the Vicinity of the Jenolan Caves by W. F. Blakely and J. C. Wiburd. *Agric. Gazette N.S.W.*, xii. 1390.

ROSS, W. J. C.—Notes on the Flora of Bathurst and its Connection with the Geology of the District. *Report A.A.A.S.* vii. (Sydney), 467.

E11, E10, C2.

Cunningham, A.—Journal of a Route from Bathurst to Liverpool Plains. *Barron Field's Memoirs on N.S.W.* (1825), p. 131.

C1. Wagga-Forbes-Dubbo County.

Woolls, W.—The Botany of the Castlereagh District. *Lectures on Vegetable Kingdom* (1879), p. 61.

W2. Cainozoic County.

Woolls, W.—Plants of the Darling (Lower). *Contrib. to Flora of Australia* (1867), p. 192.

Deane, H.—List of Plants collected at Broken Hill and Tarrawingee, N.S.W. *These Proceedings* (2) viii. 329.

W3. West Silurian County.

Cambage, R. H.—Notes on the Botany of the Interior of New South Wales:—

1. From the Darling River at Bourke to Cobar. *These Proeeedings*, xxv. 591.
2. From Cobar to the Bogan River above Nyngan. *Ib.* p. 708.
3. Mudall on the Bogan to Euabalong on the Lachlan. *Ib.* xxvi. 197.
4. Mt. Hope to Parkes. *Ib.* 317.

ii. Some Geological Considerations.

a. Adaptability of plants to certain geological formations.

The question of the connection between the botany and geology of a district is a fascinating one, but it must be confessed that we possess very few facts at present in regard to the extent that certain plants prefer, or are characteristic of, certain geological areas.

Mr. W. J. Clunies Ross, to whose paper* I have already referred, is carefully examining the flora of the geological formations of the Bathurst district, a line of research for which his geological and botanical knowledge specially fits him. I do not know of any other similar researches of recent date in this State. Mr. W. Christie's paper,† also quoted, may be usefully studied in this connection.

Howitt has a paper‡ which deals with the distribution of Eucalypts on certain geological formations and soils in the masterly way that surprises no one who is acquainted with the depth of his knowledge of geology and botany. Although it applies to Gippsland, many of his observations are directly applicable to New South Wales.

Granite country does not appear to produce good timber in any part of Australia, while timber grown in swampy, low-lying ground is generally deficient in strength. These are generalisations that the ecologist will bear in mind.

Mr. Sydney B. J. Skertchly, Assistant Government Geologist, Queensland, in 1897 published a paper on the "Copper Plant" (*Polycarpæa spirostylis*, F.v.M.) to accompany his Report on the Mines of Watsonville, etc, in which he produced evidence that this plant frequently accompanies copper deposits in Queensland. He also gives a few instances which have come under his notice of the partiality of certain plants for certain geological areas, and also gives a few extra-Australian references. Still, we appear to have but few data on the subject. In Europe the subject has received attention since the time of Unger, and some general facts and observations bearing on the question will be found in Kerner and Oliver (ii. 495 *et seq.*).

In this connection I do not propose to touch upon the fossil flora of Australia and its interpretations; this has been considered by Unger in his "New Holland in Europe" (trans. in Seemann's *Journal of Botany*, Feb. 1865), by Ettingshausen and

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* p. 771. † p. 771.

‡ *Trans. R. S. Vict.* 1890.

other eminent authorities, and the line of research is now being patiently investigated by one who possesses an intimate knowledge of our existent flora—my friend Mr. Henry Deane. We have an excellent geological map of New South Wales published by our Geological Survey, but a cursory examination of it shows that it can only be very partially used (in the present state of our knowledge at least) for the purposes of botanical record. This is, however, simply because the records of the geological survey of New South Wales are so much in advance of the botanical ones.

b. THE DISTRIBUTION OF PLANTS AFFECTED BY VOLCANIC OUTBURSTS.

In this matter of plant-distribution, when one contemplates apparent gaps in species between northern and southern localities, *e.g.*, when certain species common on the southern tableland give the Port Jackson district a wide berth and make their reappearance in, say, New England, one may ask, to what extent is the destruction of forests caused by volcanic outbursts responsible for the gaps in the sequence of forests in Australia? Mr. J. J. Fletcher has pointed out to me that Prof. R. Tate has discussed the matter* in connection with the paucity of land-mollusca in Victoria, but as regards the destruction (if such occurred) of the flora. I do not know whether geologists have published any evidence on the subject. It is only proper to reiterate that the records of a botanical survey are so very imperfect, that one must proceed very cautiously in stating that there are any gaps in the flora which may not be attributed to denudation of the soil and other causes, and where gaps appear it is because observation has not yet shown that there is an irregular line of continuity of occurrence† in any particular species. The student of ecology will very carefully endeavour to trace these lines of occurrence of particular (at all events of important) species, and I do not doubt that full data thus collected will prove of real value to the

* Proc. R. S. S.A. iv. 73-4.

† Dr. B. L. Robinson's "Curving Boundary," *op. cit.*

geologist in his task of mapping the rocks of the country. Perhaps the question of volcanic interference with our vegetation could better be studied in Victoria, where the outbursts are geologically more modern than in New South Wales.

c. THE DISTRIBUTION OF PLANTS AFFECTED BY ALLUVIAL DEPOSITS.

In dealing with the question of plant distribution, one enquires to what extent catastrophes by alluvial deposits have affected our flora.* I fancy that here again we have but little evidence. Where plant remains (of existent plants) are found they are generally logs of timber, woody fruits, resin and such like substances that are practically imperishable if entirely immersed in water, or freed from action of the air through sealing with silt-like deposits. As a very general rule the leaves and other soft portions of plants become, under such circumstances, disintegrated into a peaty mass or decay altogether. I give one of a number of recorded instances of submerged forests. A log, probably of a Eucalypt, was found in cutting a deep dyke. "The first three or four feet consisted of chocolate soil, which merged into a yellowish-clay loam, darkening again at the depth of about 10 feet into a peaty substance."† The deposit is further described.

I have recently‡ given instances of fossil or subfossil resins being found in Australia. They probably, in many cases, indicate submergence of forests by alluvial deposits, but of the magnitude of the destruction of the forests we know nothing.

Mr. E. F. Pittman, in a letter to me, says, "It is not an uncommon thing to get fossil resin (retinite), in connection with

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* Mr. E. F. Pittman, Government Geologist, kindly informs me that he knows of nothing like "extensive destruction of forests in this State by alluvial deposits. We get fossil trees in most of our deep (basalt-covered) leads, but nothing, so far as I know, in the way of extensive destruction."

† Col. W. V. Legge. "Note on timber found beneath alluvial drift at Swansea (Tasmania)." *Proc. R. S. of Tasm.* iv. 68.

‡ *Proc. R. S. N.S.W.* xxxv. 201, 202.

lignite, but I do not see how this bears on the question referred to. I may mention that rather extensive deposits of lignite occur in alluvial deep leads (in old river beds) at Kiandra, Forest Reefs, Molong, Gulgong, &c. I do not know whether you would consider this as evidence of extensive forest destruction, and the cause of these deposits, occurring as they do, in old *river beds*, is not quite clear to me."

I am aware that changes in the distribution of our forests have probably more to do with climatic changes than volcanic or alluvial action (of the kind indicated). For example, we have evidence that at the close of Tertiary times there was a much greater rainfall than there is at the present time. The late Mr. C. S. Wilkinson, in his Presidential Address delivered before this Society in January, 1885, dealt ably with the subject, in regard to which there is already a copious bibliography, but at present I am alone concerned with the evidence, imperfect as it is, of the changes owing to the forms of geological action I have indicated.

iii. The "Plains" of the Dorrigo; a Plea for the Study of Physiographic Ecology.

One phase of a botanical survey is the study of physiographic ecology. The aims and scope of this quite modern subdivision of botanical research are indicated, and a masterly summary of the ramifications of ecology generally given by H. C. Cowles.* Warming, in his classical work, divides what he terms "plant societies" into hydrophytes, mesophytes, and xerophytes, and ecologists have largely developed Warming's ideas with an extent of detail only possible because of the minuteness with which botanical surveys have proceeded in older countries, or at all events, because of the mass of data available.

A. N. Whitford has a valuable paper† supplementary to that of Cowles, whose pupil he is. He defines the factors to be taken

* The Physiographic Ecology of Chicago and its vicinity; a Study of the Origin, Development and Classification of Plant Societies. *Botanical Gazette*, February, 1901, pp. 73 *et seq.*

† The Genetic Development of the Forests of Northern Michigan; a Study in Physiographic Ecology. *Botanical Gazette*, xxxi. 281 (May, 1901).

into account in attempting to explain the relations that exist in different plant associations.

A. Climatic factors.
   (*a*) Temperature.
   (*b*) Moisture.

B. Ecological factors.
   (*a*) Edaphic (the soil and its properties).
   (*b*) Atmospheric (heat, light, and influence of wind).
   (*c*) Hydrodynamic (action of tides and waves on strand vegetation).
   (*d*) Biotic factors (struggle for existence).

C. Historic factors. (Factors which involve the element of time, *e.g.*, certain geological and physiographic forces).

In tracing the genetic development of a forest, Whitford selected certain islands, etc., in the vicinity of Lakes Michigan and Superior, and examined four sets of physiographic formations :—

1. The Sand Societies.
2. The Clay Societies.
3. The Rock Societies.
4. The Swamp Societies.

Taking (1), he deals in succession with the "lower beach," "middle beach," "fossil beach," "heath," showing how a coniferous forest established itself in course of time on the heath, which is eventually succeeded, and even superseded, by the maple, beech and hemlock forest. The dune societies are incidentally touched upon.

(2) The Clay Societies are more difficult to trace than those found on the sand; but "in due time a maple-beech-hemlock condition is the result."

(3) The Rock Societies are traced, and in the locality selected it is shown that on the rocks (mostly granites and quartzites) the mesophytic forest (of maple, etc.) is not reached until first preceded by a coniferous forest.

(4) The zonal distribution of plants in swamps, as far as certain localities in the United States are concerned, is given, and in general terms it is shown how the mesophytic (hemlock-maple) forest finally replaces the arbor-vitae or tamarack trees.

The paper finally deals with the effects brought about by human agency, the "clearing societies" brought into existence through the agency of man and domestic animals. As in the United States, so in New South Wales, there are but few useful records of plant-succession in clearings.

Little has been done in Australia in physiographical ecology. I do not know that a systematic attempt has yet been made to classify "plant societies" in this continent. Following are some of them, but each group must be considered in regard to geological and dynamical changes always in progress in any given area.* No attempt is made to give a complete list; it is simply a suggestion.

Littoral Plants.
Coast Sand-dunes.
Western Sand-hills.
Brackish and Mangrove Swamps.
Brush Forests.
"Plains" (Dorrigo and others).

As an instance of the way in which the study of ecology may be applied in a special case, let me bring under your notice portions of the Northern Tableland, with especial reference to the plains of the Dorrigo. I have briefly described these grass plains and the brush lands,† and my two papers (*loc. cit.*) on this area may be referred to. I feel that in the light of later experience I ought to undertake another visit to endeavour to solve some of the ecological problems I propose to bring under your notice, and which are of more than local interest, but I should be very glad if a young naturalist with fewer demands on his time than I have would carefully explore it.

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* See p. 784.

† *Agric. Gazette of N.S.W.* v. 221.

The "plains" have much in common, I believe, with the "park lands" of Central Africa. Mr. J. E. S. Moore read a paper on the latter before the Linnean Society of London on 1st November, 1900. I have not seen the paper, but the following is an abstract:—

"These park lands in the Tanganyika have quite the appearance of having been formed by the hand of man, but are really natural growths, due to the fact that light surface soil has been laid down over what Mr. Moore takes to have been lake deposits. Any given line of country will show large plantations, with quite a home-like look, separated by grass lands; and, as Tanganyika is approached they dwindle in size till they consist of a few shrubs, overshadowed by giant Euphorbias, cactus-like in appearance. Then come stretches of grass, dotted with Euphorbias, and, last of all, the salt steppes by the Lake, which is now held to have had at one time an outlet to the sea. Mr. Moore's explanation is that, at first, only the Euphorbias would grow on the salt steppes; but as these sprang up they afforded a shade and shelter to self-sown shrubs, each of which, as it established a footing, contributed to the natural planting of the area by the distribution of its seeds, till this process reached its highest development in the large plantations where the shrubs overtopped the Euphorbias to which they owed their growth."

In passing reference to Central Africa country in comparison with our own, Sir Harry Johnston has a figure and description* of a "fine mountain which, like most Central African mountains, presents from below the appearance of a cake that has been cut and is crumbling." This mountain presents remarkable similarity to Mount Lindsay and other mountains in North-eastern New South Wales.

My personal acquaintance with the Ceylon patanas is of a very limited character, but I have long held the view that the plains of the Dorrigo present somewhat similar problems. Mr. H. H.

* "British Central Africa," by Sir Harry H. Johnston (1897), p. 25.

W. Pearson has an important paper on "The Botany of the Ceylon Patanas" (*Journ. Linn. Soc.* xxxiv. 300), and much of the information contained in his paper (which includes an excellent bibliography) will be found full of suggestion to us. Patanas "are grassy slopes and plains of considerable extent occurring at all elevations above 2,000 ft." "Remarkable savannah-like expanses in an otherwise forest-covered country" (pp. 300, 301). They correspond, in fact, to the plains of the Dorrigo and other portions of the northern tableland.

Where the patanas come into contact with the western forest, the boundary lines* are remarkably sharp and abrupt, though quite irregular and in no way related to any physical features of the land (p. 305). This also corresponds to the condition of things in the New South Wales localities cited. "In the east, the patanas pass gradually into an open park-like forest consisting of low xerophytic trees and an undergrowth of grass" (p. 306). To what extent the Dorrigo plains differentiate into an open park-like forest is a matter for further enquiry, and careful examination will show how much of the vegetation may be properly termed xerophytic. "The existence of extensive, comparatively barren, patana-areas in the midst of the luxuriant sub-tropical growth of the montane region, and, more particularly, the manner in which they abut upon the boundary of the western forests, have attracted the attention of many observers." To account for the existence in such close proximity of two floras so widely different, three theories have been advanced (p. 307) :—

i. Trimen's Theory.
ii. Abbay's Theory.
iii. Grass-fire Theory.

* The line along which two plant societies meet has been called the tension line, whether between forest and heath or forest and prairie (plain, in the Dorrigo sense). Here it is that the struggle is most pronounced. If the other ecological factors remain constant, the tension line does not change. In that case, for instance, the forest does not advance on the heath nor the heath on the forest. But, as will be shown in the discussion of the historical factors, the conditions, as a rule, are changing constantly. Not only may the struggle be between the forest on the one hand and some other type of plant society on the other, but it may be between different kinds of forests. (H. N. Whitford, *op. cit.* p. 293).

i. *Trimen's Theory.*

"Trimen gives his opinion respecting the maintenance of a definite line of separation between the western boundary of the patanas and the forest. He says that 'In the course of vast ages a perfect equilibrium between the two floras [*i.e.*, patana and forest] has been arrived at, so that now neither can encroach on the other: the patana plants are unable to exist in the dense shady forest, whilst the seeds of the forest-trees never get a chance even of germination in the closely occupied grass-land. So far as can be observed, this balance is now maintained without change.'" Pearson, however, shows that some change is taking place, though so gradually that it may be easily overlooked (p. 307).

ii. *Abbay's Theory*

(as regards one patch of the patana) is that the outcropping of "half-formed quartzite," which disentegrates into "little else than a quartz sand impregnated with iron, is entirely incapable of supporting the usual forest vegetation with which the district, except in this particular spot, abounds."

Pearson shows that this explanation can only be a partial one, and is dependent on geological data which are not forthcoming. The same remarks apply to the plains of the Dorrigo, no adequate geological data being at present available. The matter is of direct economic interest, inasmuch as settlers require information as to the soils. On the occasion of my trip, I made a carefully collected series of soils from both plains and forest, but unfortunately an accident happened to them while they were awaiting analysis. Careful analyses of the soils, selected, if possible, by a geologist, would, I doubt not, throw light upon the types of vegetation that are at present borne by the two kinds of land.

iii. *The Grass-fire Theory.*

The patana grasses are very coarse and wiry, and in their adult condition are unpalatable to cattle. The graziers' custom is to burn the grass annually to get a young growth of grass. "The country is temporarily reduced to a blackened waste which

extends up to the very edge of the forest, where shrivelled leaves and charred trunks bear testimony against the maintenance of a permanent forest boundary. It is evident that the cumulative effect of such fires during a succession of years must be to materially extend the boundaries of the patanas at the expense of the forest. Experience shows that the constant occurrence of the patana fires is gradually extending the area of the patanas in a westerly direction into that previously covered by forest. With regard to the origin of the patanas as a whole, the cause is not so clear; there is a total absence of local tradition relating to a time when the main area of the Uva patanas was in any marked way different from what it is now."

"Above 4,500 ft.,* wide tongues of patana extend in a westerly direction up to, and in some cases over, the summit of the central ridge. There can be no doubt that these extensions are due to the encroachment of the Uva grass-fires into the montane wet-zone forest. Upon the cleared area a herbaceous vegetation has established itself, the remains of which form an accumulation of sour humus which is almost uniformly present on the surface above 4,500 ft. The properties of sour humus are such that forest-trees can with difficulty re-establish themselves upon it. It therefore follows that, apart from the effects of the present annual fires, the sharp boundary, once established by fire, would so gradually become irregular by the advance of forest-growth that only careful observations, extended over a long period, would be able to detect any change. Hence has arisen the idea that the present limit of the forest is a stationary one."

A careful survey of the Dorrigo plains, which is required in the interests of science, would show to what extent there is similar herbaceous vegetation between the plains and the forest. As regards the Dorrigo plains, the country as we know it is probably as it has been for many years; in bygone years doubtless the blacks fired the grass, and the white man has done the same by design or accident, but apparently not to any great extent

* In the latitude of the Dorrigo this would approximately correspond to the height of the Dorrigo plains.

In two papers,* Dr. Bessey maintains, from recent observations, that the greater portion of the State of Nebraska is capable of supporting a tree vegetation. He claims that the absence of trees is due to the prairie fires, and that now, wherever given a chance, the tree area of the State is spreading. In many places in our own State (including the Dorrigo) it is roundly stated that trees will not grow in certain localities, *e.g.*, grassy areas. If the statements were confined to "Trees have never grown on those areas since the country has been known to the white man," or "I do not think that trees will grow on these areas, but I have never tried the experiment," we should be on firmer ground. It has yet to be proved that these "plains" of the Dorrigo are incapable of supporting arboreal vegetation, though whether the planting would be undertaken on economic grounds is quite another question. The extent to which climate has been cause and effect in the matter is not known as regards the Dorrigo, in view of the short period that the country has been known to the white man, and the paucity of meteorological records.

Incidentally (p. 326) Mr. Pearson discusses the matter of ethereal oils in the *Labiatæ* and grasses of the patanas. I am sorry I made no observations of this character in regard to the Dorrigo plains. He reviews the interpretations of Tyndall's observations in regard to the arrest of radiant heat through the diffusion of minute quantities of essential oil in the atmosphere, also Dixon's later researches, all of which is important in view of the desirability of a clearer understanding of the effects on climate and vegetation in Australia of the exhalation of natural Eucalyptus oil.

Much of the collecting in New South Wales is of a spasmodic character; as far as I know, the term "advanced collector" is only applied to the votaries of the postage-stamp cult; I would apply the term, if it be necessary to coin one, to the collector who collects with a definite object other than that of systematic

* "The Forest and Forest Trees of Nebraska." *Rep. Nebraska Board of Agriculture*, pp. 79-102, 1899.

botany, say, that of solving problems of ecology. The field of physiographic ecological study is vast, and it will be found most fascinating. It has not been taken up until late years because, in many cases, the necessary geological and botanical foundational data were not available. It is obvious that every district requires its own special treatment. Following is a brief statement of the method of classification adopted by Cowles* in dealing with the Chicago area, and it may be observed that he is the first botanist to clearly bring out the dynamic conditions due to physiographic changes.

"Two general groups are made, the inland and the coastal. The inland group is subdivided into three series, river, swamp, and upland. The coastal group is subdivided into two series, lake bluff and dune. The river series is remarkably tortuous, involving constructive and destructive, progressive and retrogressive phases. The treatment begins with an erosion gully; then there follow in order the ravine, both in clay and in rock, the xerophytic bluff, and the mesophytic forest. The depositional phases of the river begin with the appearance of a permanent stream; then follow the various stages of the flood-plain, culminating in the mesophytic forest. The swamp series begins with the pond, treats next the various types of swamps, and ends with a brief discussion of the prairie. In the upland series the various stages of the rock hills and then of the clay hills are taken up in turn, culminating in the mesophytic forest. The coastal group is next discussed, beginning with the lake bluff. Finally, there is a brief treatment of the dune series from the beach on through the embryonic and active dune to the established dune on which there finally appears the mesophytic forest."

The special ecological classification adopted by Thomas H. Kearney† for the vegetation of Ocracoke Island is worthy of note, and the paper itself contains many valuable suggestions.

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* *Op. cit.* p. 85.

† The plant-covering of Ocracoke Island; a study on the Ecology of the North Carolina strand vegetation, by Thomas H. Kearney, Junr., *Contrib. from U.S. Nat. Herb.*, Vol. v., No. 5 (1900).

iv. The so-called "Spontaneous" Growth of Trees.

Allied to this "Patana" question is that of the so-called "spontaneous" growth of trees.

"I was informed* here (Failford) and also on the A. A. Company's Estate (Gloucester) that formerly the hills were often destitute of timber where now there is dense forest. The reason of this change is attributed to the overstocking of the country, the stock eating down the grass, so that bush fires (which formerly consumed the seedlings of forest trees) are now less frequent, and devastate smaller areas of country than they used to do. . . . Mr. Forester Rudder expresses the opinion that cattle directly aid the propagation of trees by trampling the seeds into the ground."

In Tasmania (perhaps in Australia) the following experience is not uncommon. Where sheep are folded the manure becomes quite thick. In a few years, if the sheep be removed, Eucalypts come up freely. This occurs in places in which they were not previously found. It seems to me that this points to the sheep licking up the seed with their feed and redepositing it in manure. Vigorous growth would take place in fertilized soil. Perhaps this matter of natural afforestation (not re-afforestation, as it takes place in areas not previously known to carry trees), may be entirely explained by herbivora grazing in forest land and depositing their dung on non-forest land. The obvious reason why this afforestation does not take place more abundantly is because sheep and cattle readily eat down young seedlings, which must therefore be protected accidentally or otherwise in order that they may reach maturity.

Howitt deals with the "Influence of Settlement on the Eucalyptus Forests" in his paper on the Eucalypts of Gippsland (*op. cit.*). He speaks of the annual bush fires of the aborigines which tend to keep the forests open; consuming much of the standing or fallen timber and largely destroying the seedlings. At the

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* Maiden in *Agric. Gazette N.S.W.* vi. 593 (1895).

same time these burnings off destroy many of the insects that prey on Eucalypts. When the white man came he discouraged bush fires, and the young seedlings had now a chance of life. He gives specific instances of whole tracts of country being covered with forests of young saplings since the advent of the white man. No one has a more intimate knowledge of Gippsland than Mr. Howitt, who says, "in spite of the clearings which have been made by selectors and others and in spite of the destruction of Eucalypts by other means (plagues of leaf-eating insects) the forests are more widely extended and more dense than they were when Gippsland was discovered by the white man."

This natural spread of forests should be a comfort to those who are apt only to consider the destructive action of the timber getter, and to lose sight of the compensating influences that are at work.

The springing up of young forest growths where there was formerly forest is, of course, common enough. We do not know how long many seeds will remain dormant in or on the ground after the old growth has been removed. It is not an uncommon thing to see a straight avenue of trees not artificially planted. One fine avenue known to me is along the line of an old chock and log fence, and consists of She Oaks (*Casuarina*).* Oak saplings were used as top-rail for this fence, and the seed from the saplings germinated and the young growth was protected from stock by the fence. The seedlings grew into fine trees, and finally the old fence was removed, leaving only the line of trees which followed the direction of the fence.

6.—Australia's Duty in regard to Botanical Investigation in Australia and Polynesia.

The South Sea Islands are of special interest to us in New South Wales, Sydney having more intercourse with them than any other Australian port. They are mainly under the political control of Great Britain, France, and Germany, and all three

* *E.g.*, *Agric. Gazette*, vii. 514.

nations have most honorable records in regard to the advancement of botanical science in those regions. At the present time most of the botanical work in the Islands is being done by Great Britain and Germany. The former is carrying on the work, speaking generally, in an intermittent way, organised expeditions for collecting purposes and investigation being infrequent. She has enormous numbers of types, and largely relies on the free-will contributions of travellers and others. Germany, on the other hand, is systematically working up the floras of her dependencies, and the efforts of the Royal Botanical Museum at Berlin in this direction are continuous and indefatigable. A number of publications, some of them of considerable proportions, have already been issued, and every year adds to the volume and value of them. Our German friends attain these results in a variety of ways. Their governing officials in the islands often include scientific men, some of them botanists, or at all events botanical collectors. The Imperial Government, through the Royal Gardens at Berlin, or through other botanical establishments, wholly or partially defrays the expenses of young botanists engaged in definite lines of botanical research. The medical officers of her steamships and war-vessels are often men with more or less botanical training, and, I am given to understand, receive greater encouragement to solve botanical problems or to make botanical collections than do British officers in similar situations. The acquisition of botanical collections is, in a measure, incompatible with that preservation of faultless tidiness of decks and other parts of the ship which are the traditional pride of a commander of a British man-of-war, while the accommodation available to officers for the storage of collections, books, &c., is so limited as, in many cases, to preclude a man from preserving any specimens to illustrate the observations recorded in his note-book. This is the more to be regretted, as warships, during police or surveying duty, often touch at places which are rarely, if ever, visited by trading vessels. Has not the time arrived when Australia should systematically undertake a share of this botanical work in the South Seas? Are we to sit down and let British, French, and

German botanists do all the work and permit the world to assume that Australia is unwilling or incompetent to help to reap the harvest? Cannot the Federal Government, or individual State Governments, or our Universities, despatch young University graduates with missions to these islands, or even pay the expenses of trained collectors to systematically acquire material for the botanical establishments of the mainland? I am not suggesting any impossible idea, nothing costly or beyond our resources in any way. Australia is waking up to her responsibilities and destiny in various ways. Her States have federated. Her troops have fought shoulder to shoulder with those of other parts of the Empire. She has sent forth commercial ambassadors to London, to South Africa, and to the East to make her name and her products better known. The carrying out of my suggestion to maintain, say, two young botanists and one collector in the Islands, would involve an aggregate cost scarcely greater than £1000 per annum for salaries, travelling and incidental expenses. I would give a young botanist a commission for say two years, and if he were doing good work and desired a further term, an extension could be arranged. It will be seen that I have allowed for small salaries; nevertheless I believe that suitable volunteers, anxious to win their scientific spurs, would always be forthcoming.

But let us come a little nearer home. When I was in Berlin in 1900, I was informed that the Royal Botanical Garden there was on the point of despatching two young botanists to investigate the flora of Western Australia. They have remained in that State fourteen months, and, I believe, have done magnificent work. They are now engaged in visiting all the other States, and I do not doubt that an account of their researches will prove very valuable to us. But might not Australian botanists be excused if they were to be a little envious of the great good fortune of their German brethren? Many of our botanists would dance with joy if they could be detached for botanical investigation for fourteen months, or even for half that period, in many localities that would be promptly indicated. Our own Government, which maintains two botanical collectors (attached to different institu-

tions), whose sole duty it is to investigate the botany of New South Wales, is largely seized with its duty in the matter of botanical work, but I hope the time is not far distant when our well-to-do citizens will feel moved to devote a portion of their wealth to the advancement of botanical work irrespective of the political borders of the Australian States. It is, in fact, impossible to investigate the botany of any one State without overstepping the territory of others, but there is much virgin country yet within New South Wales, and I trust the plea I have advanced will not be in vain.

7. Hybridisation Work in New South Wales.

During the past year an interesting Orchid hybrid raised by one of our Members (Mr. F. Godwin, gardener to Dr. John Hay) was exhibited before this Society. It is *Cymbidium Lowianum* × *C. eburneum*, and it is figured and commented upon in the *Gardeners' Chronicle*, 13th July, 1901, p. 25. The statements are made, "This is the first, so far as our knowledge goes, cross-raised and flowered in Australia. . . . The flowers measured 5½ inches across, which is quite equal to the standard in point of size."

For an account of the extensive and successful work that has been carried out in Europe and America in regard to the cross-fertilization of plants, one need not go further than the records of the Hybridisation Conference held in London in 1899, which was fully reported in gardening and botanical journals, and in the Journal of the Royal Horticultural Society. Mr. Peter Barr's address on Hybridisation before the Royal Horticultural Society of Victoria in August, 1900, on cross-fertilising daffodils is valuable, and so also are the papers on the same subject by Mr. H. H. B. Bradley, of Sydney, in the "Australian Agriculturist" for October and November, 1900.

Mr. Julius H. Camfield, a Member of this Society, contributed a useful little paper to the same Journal in its issue of November, 1901, in which he makes suggestions for experiments with certain native plants.

Many successful variations are not the results of experiment, but of accident. An observant man making his rounds through his garden has acquired fame, and sometimes fortune, by observing peculiarities in the growth of self-sown seedlings, fertilized without human aid.

Progress with hybridisation and selection work in Australia is slow, as we have not at present a number of well-to-do amateurs possessing the necessary knowledge and enthusiasm, as in older countries. Many experiments in hybridisation (and not a few with varieties) have been carried on at the Sydney Botanic Gardens, chiefly by Mr. George Harwood, a veteran in experimental work. In fact I doubt whether any man has done more in this direction in New South Wales than my colleague. I am happy to say that some experiments are still proceeding at this establishment in regard to which I hope to be able to announce successful results later on. In a recent Annual Report of the Gardens I expressed the hope that we may have a small physiological laboratory to serve for the headquarters of experiments in hybridisation and for cognate work with our delightful wealth of material. When public opinion is sufficiently educated in this matter, I do not doubt that Parliament will readily place the necessary funds at my disposal for the employment of one officer whose exclusive duty it will be to carry out experiments of the kind, and for means (necessary in a public garden) of protecting our experiments from the depredations which have discouraged us so much in the past.

Many crosses, *e.g.*, of Verbenas are the result of accident. The difficulty of raising plants begins when one gets so far as making a cross. If any accidents happen to these seedling plants one, of course, has to work *de novo*. We have to select parents, to wait until the seed has set, then to wait until the plants can be raised, and further wait until flowers are obtained. These results often take several years to obtain, and may in the end have little or no horticultural value. Many of our experimenters have had disappointments, but I am sorry they have not kept a careful record of their results. If the experiments are worth making at

all, they are worth recording, and even negative horticultural results have scientific value.

Returning to Mr. Godwin's work, I am glad to hear that he is working at *Cattleya* and *Laelia* hybrids, also at *Cypripedium*, *Zygopetalum*, *Lycaste*, *Dendrobium* and *Phaius*.

Mr. Hugh Dixson, also one of our Members, has obtained good results with *Dendrobium bigibbum* (an Australian species), *Phaius* and *Spathoglottis;* while Mr. Williams, gardener to Mr. Onslow, of Camden Park, has done good work with *Vanda teres* and several *Cypripediums*. Mr. D'Arcey, Orchid-grower at the Botanic Gardens, has experimented with *Cattleya*, *Laelia* and *Cypripedium;* while Mr. Hazlewood, of Botany, is another experimenter with Orchids.

Most of us admired the beautiful *Hippeastrums* raised by the late Mr. Burton Bradley. His son, Mr. H. H. B. Bradley, has obtained a solid reputation with *Narcissus*, and for some account of his work my readers may refer to his paper already quoted. He tells me that his father left no record of what he did with *Hippeastrum*, and with regard to present work, he writes, "What I have done with other flowers is immature; perhaps if I live another twenty years I may have something to say about it."

Of other bulbous plants I have little to say. The late Sir William Macarthur did good work with *Gladiolus* and *Crinum*. Mr. Baptist had many successes with *Hippeastrum*, but like Mr. Burton Bradley, made no records. Mr. H. Selkirk, of Sydney, is at work cross-fertilising bulbs, and we may expect results from this conscientious worker in due course. The late Mr. T. S. Mort obtained excellent results with *Phyllocactus*. Although the employer of gardeners, he himself undertook the work of polliniating as a recreation from his many absorbing public pursuits. Mr. W. H. Catlett, later on, did good work with the same group of plants.

With *Anthurium Scherzianum* the same cross has given Mr. Godwin rose-pink, geranium-lake, and a good white variety. Mr. G. H. Kerslake, of Rookwood, has done a good deal in cross-fertilising Chrysanthemums and Bouvardias, and has attained

some fine results. Both he and Mr. J. H. Horton have raised good Chrysanthemums which have been approved in England. Mr. Kerslake and Mr. W. M. Butterworth have both raised some fine Dahlias, and Mr. H. J. Carter has raised some very good Carnations.

A considerable number of florists' flowers, such as Roses, Dahlias, Carnations, Pansies, Gladioli, Hippeastrums, &c., have been raised by various horticulturists of this State, but I have no details of their work, nor do I even know, in most cases, whether they were crosses or varieties.

Let me invite your attention to the beautiful water-colour drawings of a fine series of *Hibiscus* raised at the Sydney Botanic Gardens by Mr. George Harwood. They are true hybrids, in my opinion, although there is some doubt at present as to whether the parents are distinct species or only extreme forms of the variable *H. rosa-sinensis*.

The drawings show five seedlings, the parents being *H. rosa-sinensis*, var. *General Courtegis* (pollen-bearer), and *H.* sp. (perhaps a form of *H. rosa-sinensis*) from the South Sea Islands (seed-bearer). Only one fruit has been produced from the seed-bearing plant during the fifteen years it has been under cultivation in this State.

The flesh-pink flower has been deservedly admired, both for the delicate colour of its petals and for the size of its flowers. It flowers freely in the Sydney Botanic Gardens, is well worthy of a name, and I have much pleasure in calling it "George Harwood," after its raiser.

I understand that the late Mr. R. D. Fitzgerald did some work with the cross-fertilization of *Hibiscus*, *Abutilon*, &c., but I have not been able to learn any particulars of his results.

Such is a cursory account of what has been done in hybridisation or cross-fertilisation by workers in this State, often under great disadvantages, and I hope that a mere recapitulation of it will incite others to further enterprise.

8.—Comparative Study of Seedlings and Suckers (A Phase of Ontogeny).

"I would call attention to recent researches in plant ontogeny; the investigation of embryonic development, the comparative study of seedlings, and such observations as have been recently made by Prof. R. T. Jackson upon the reappearance of juvenile and ancestral traits in offsets and runners."*

Dr. Robinson then points out that while systematic zoologists have long made use of ontogeny in determining group affinities, botanical taxonomists have been much less successful in drawing from the early stages of plants like inferences. "Ontogeny has for the plant-taxonomist a wealth of information as yet unrevealed regarding the affinities of genera within the family, and species within the genus. . . . The form, position, and venation of leaves, the nature of the petioles, stipules, pubescence, and glandularity, all shown in the seedling, are significant." Let me draw attention to this fascinating field of enquiry in Australia. The only genus, as far as I am aware, in which observations have been systematically made in this direction is *Eucalyptus*. Mueller drew attention to the value of seedlings and suckers for diagnostic purposes, and Mr. Deane and I may fairly lay claim to have insisted on their great importance in taxonomic work. Lubbock's work on seedlings will at once occur to one in this connection. Mr. L. Cockayne† has recently published some valuable observations on seedlings in continuation of his former researches, while at the Sydney Botanic Gardens I have inaugurated a systematic examination of seedlings. The study of suckers and seedlings places a powerful weapon in the hands of systematists in the classification of plants. It is obvious, of course, that the experimenter who undertakes this line of research should either be a good systematist himself, or should co-operate with one. I have

* Prof. B. L. Robinson, *op. cit.*

† An Inquiry into the Seedling Forms of New Zealand Phanerogams and their Development. *Trans. N.Z. Instit.* xxxiii. 265.

thus cursorily alluded to a subject which is so important and so full of general interest that it deserves much ampler treatment.

9.—Eucalyptus.

(*a*) *A critical revision of the genus.*

Many years of travel in our forests, and critical examination of botanical material, brought the fact home to me very clearly that in many cases it was necessary to obtain access to types. Many species of our national genus *Eucalyptus* were described at a period when botanical descriptions were frequently inadequate; furthermore, recent monographers had not access to certain types at all. I arrived at the conclusion that the only satisfactory way of dealing with the genus was to obtain the original description in every instance and, if possible, the loan of the type, a gift of a co-type or a fragment of the type or, in the case of uniques, a drawing made by a botanical artist. The principal object of my visit to Europe in 1900 was to ascertain where the types were, and to inspect as many as possible. I made copious notes in various British and foreign herbaria, made arrangements for copies of descriptions from works not in any Australian library, and for faithful drawings of uniques. For these I am chiefly indebted to the kindness of Kew. Since my return I have been entrusted with the loan of a number of important collections of specimens of the genus numbering from about forty to nearly a thousand. It is a mark of confidence in ocean steamships, and in me personally that I much appreciate, that directors controlling irreplaceable national collections should permit their treasures to be sent to the Antipodes and back. Many of the specimens are of the greatest interest and a number, I find, were not seen either by Bentham or Mueller. Where duplicates of rare specimens were available, they have been willingly presented to the National Herbarium at the Botanic Gardens, and it is an advantage to science that I have figured uniques, for one shudders at the sight of a priceless, unfigured specimen, that might readily be damaged or entirely lost. I am going to the bed-rock, so to speak, with every species, and have already made a large number

of interesting observations. A number of discoveries of more or less importance are only awaiting time and opportunity for publication; in other cases interesting lines of enquiry have been suggested which, it is hoped, may, in some instances, lead to a better knowledge of the genus. The research has developed into one of far greater magnitude than I anticipated when I left for Europe, but I have put my hand to the plough and will not turn back.

b. Variation in Eucalyptus under cultivation.

The variation of Eucalypts under cultivation is remarkable, and study of it promises some valuable results. So much, indeed, do these plants depart from the types that Naudin, Trabut and Kinney have between them described a large number of new species from cultivated plants in the south of France, in Algeria and in California respectively. Mueller always maintained (1) that it was in the highest degree improbable that species unknown in Australia should have persistently escaped the notice of collectors other than seed-collectors; and (2) that the cultivated species were really varieties of spontaneous species. I have seen additional cultivated "species" which have been published since Mueller's death and others which he never saw, and I also agree that those I have seen so far are but cultivated varieties of our species. However, in order to make observations really valuable, collections of cultivated Eucalypts should be made in as many parts of the world as possible. I have already accumulated a large series, and it is my intention to depict variations from the type, this being a research in which profuse pictorial illustration is absolutely necessary. So far as I have gone, I can say that Eucalyptus under cultivation exhibits variations which throw valuable light on the affinities of the spontaneous varieties to the types, and also indicate affinities (perhaps in some cases unsuspected) between species. When our facts are properly classified, I do not doubt that the study of cultivated forms will be a most powerful adjunct to a study of the spontaneous ones, enabling us to better assess the relative value of species, and to group the members of this protean genus, with respect to their true affinities,

better than is possible in the present state of our knowledge. In connection with this work I have, as hinted already, been for some time collecting seedlings of various Eucalypts, in regard to which I possess, otherwise, full botanical material.

The genus *Eucalyptus* is given prominence to for obvious reasons, but the amount of variation in other genera may be as great. Where Australian Acacias have been grown for long periods, *e.g.*, in the Riviera and California, variation has (in some groups) proceeded to such an extent that it is often impossible in the present state of our knowledge to indicate the species from which they have sprung. Variation is not confined to the phyllodes, but extends to the minute floral organs.

10. What is a Species?

A species is the embodiment of a theory—a working hypothesis. It is a standard or rallying point, around which we range the vegetable units. No species can be absolutely definite, except as regards the type itself, although in the present state of our knowledge the contrary may appear to hold good in some cases. We strive after a wrong ideal by making the boundaries of a species too rigid; species-names are a convenience of classification, and the process of variation, the natural manufacture of species, is going on everywhere around us.

Inasmuch as a species is an hypothesis, there will be varying opinions as to the value of any one in particular. A man may be an extremist in two ways: he may be a consolidator or "lumper" of species; this fault of extremism is comparatively rare. Fortunately in the other direction we have few extremists of the type of Swainson,* who must have spent much of his time with his Latin dictionary hunting out adjectives, and finally "exhausted" the supply.

Swainson's Report is one worthy of more than passing notice. He was an F.R.S. and a respected scientific man (a zoologist), and

* "Further Papers relative to the Discovery of Gold in Australia." Presented to (Home) Parliament, December, 1854. Victoria, 24 Nov., 1853 (187). Botanical Report by William Swainson, Esq., F.R.S., pp. 98 *et seq.*

yet he had the temerity to give an exhibition of reckless species-making that, as far as I know, stands unparalleled in the annals of botanical literature. As a "shocking example" of what lengths an unbridled systematist may go to, it certainly should not be buried in the pages of a geological Blue-book.

EUCALYPTIDÆ.

I. Dried specimens of the sprigs in separate papers, the different genera (all new), or the principal divisions of the family, marked on each :—	
1st Series	68
2nd Series	297
3rd Series	160
4th Series (species growing on the Government Domain, Melbourne)	39
	564
II. Species and varieties contained in small paper bags, labelled as above, each containing capsules, leaves, and (where procurable) seeds and buds :—	
1st Series	33
2nd Series	167
3rd Series	691
4th Series. From the Government Domain	39
	930
III. Papers of sprigs of the capsules, etc., collected on the Blue Mountains, New South Wales	26
Total of species and varieties	1520

Pines.

A series of large bags and tin cases, numbered and named, of all the species of *Casuarineæ* examined and determined from 26th July to 29th September (a few separate packets of "unexamined species")	201
A series of large bags and tin cases of my new genus *Echinocarpus* or Grass Pines, numbered and named	21
	222

"List of species of Casuarineæ or Australian Pines, discovered, named and described by Mr. Swainson, and of which seeds and cones (mostly in abundance) have been collected for the Victorian Government."

Then follows a list of 213 species of Casuarineæ, with botanical names and English equivalents. Mr. Swainson has a note :—

"In several instances different species and numbers appear under the same specific name. All these must therefore be considered provisionary, and arose from not keeping a memorandum of the names I had already used. Without a single book to refer to, I have been obliged to leave several of the latter species unnamed (although described) rom having exhausted all the specific names I can think of that were at all applicable to the species."

There were two portfolios "with drawings and dissections, natural size and magnified, of different species and genera* of *Eucalyptideæ*." . . . "These drawings will be personally delivered to the Curator before I leave Melbourne."

I have not been able to trace what became of the drawings, descriptions (of *Eucalyptideæ* and *Casuarineæ*) and of the specimens. Mueller probably allowed them to find their way to the rubbish heap.

Hooker's *Journal of Botany*, vi. 186 (1854), has some further information in regard to Swainson's Botanical Report. Lieut.-Governor Latrobe appointed Mr. Swainson "to study and report on the timber of the colony (Victoria), chiefly *Eucalypti* and *Casuarineæ*." The Journal contains a letter, dated 2nd October, 1853, from Swainson to Latrobe, which is not contained in the official document I have already quoted.

In connection with the question of variation and limits of species, I would invite attention to Darwin's "Origin of Species." I have used the sixth edition, and chapter ii., "Variation under Nature," deserves to be carefully studied. The extracts I give have been taken from that chapter. "The general tendency of the young† naturalist will be to make many species, for he will become impressed, just like the pigeon or poultry-fancier before

* What these genera are I do not know. Swainson refers to *Canthocarpus* (Red Gum); *Tricanthus* (the "Straight Stringybark"), of which "there are numberless species;" *Microcarpus* (Native Box), of which he collected "a few species."

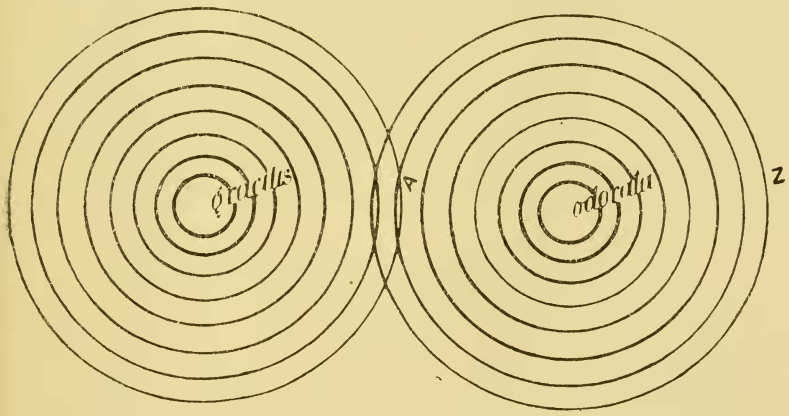
† If Darwin had known of Swainson's exploit he would have seen that this tendency is not confined to youth.

alluded to, with the amount of difference in the forms which he is continually studying."

Then again he states :—

"Practically when a naturalist can unite by means of intermediate links any two forms, he treats the one as a variety of the other; ranking the most common, but sometimes the one first described, as the species, and the other as the variety. But cases of great difficulty sometimes arise in deciding whether or not to rank one form as a variety of another, even when they are closely connected by intermediate links; nor will the commonly-assumed hybrid nature of the intermediate forms always remove the difficulty."

An extensive acquaintance with the genus *Eucalyptus* shows me that the more one proceeds with a study of it, the more we find barriers break down, variations presenting themselves in the most unexpected ways. Let me illustrate my point by a homely diagram. The centres of the circles are species, we will say *Eucalyptus gracilis* and *E. odorata*, for the sake of argument.



Around the centre of each, forms accumulate which more and more diverge from the types, as shown by the spreading circles. The plant represented by the circle at Z still belongs to *odorata*, but it is a good deal removed from the type. As these circles

diverge, they intersect the circles belonging to other species, say at A for example. In other words, a plant at A partakes of certain characters both of *gracilis* and *odorata*. A systematist may think it his duty to interpose a species at A, as he is unable to recognise it as a form of *gracilis* more than *odorata*. This does but alter the position of the difficulty, as further discoveries bring to light fresh circles which invade other spheres of influence.* To put the matter in another way,—where it is found that two species have affinities, a man may, by unduly concentrating his attention on one, imagine that the forms of both may be looked upon as forms of one. For example, it is quite easy, by a kind of induction, to make all specimens of *odorata* and *gracilis* forms of one or other species only. This is where the personal equation comes in, and to quote Darwin, "the opinion of naturalists having sound judgment and wide experience seems the only guide to follow."

A further remark of Darwin's is much to the point:—

"Hence it is the most flourishing, or, as they may be called, the dominant species—those which range widely, are the most diffused in their own country, and are the most numerous in individuals—which most often produce well-marked varieties, or, as I shall consider them, incipient species." Such species as *Eucalyptus Gunnii*, *viminalis*, *tereticornis*, and *amygdalina* present many confirmatory illustrations of the truth of Darwin's remarks. In this connection I would invite attention to Darwin's dictum:—

"Species of the larger genera in each country vary more frequently than the species of the smaller genera."

The perplexing results of attaching names to too many forms of Eucalyptus has been prominently before Mr. A. W. Howitt, with whom I have often discussed the question. He is of opinion that names should only be conferred on "groups," which is an ideal not attainable in practice, since the difficulty of defining a species is only transferred to the "group."

* This expression is a convenient one, though of course, strictly speaking, there is no "influence" at all.

Our zoological friends sometimes experience a similar difficulty, a discussion having recently taken place at the Linnean Society of London* in regard to the difficulties that present themselves in defining and naming corals.

In the matter of dealing with individual differences of forms, Darwin may again be quoted :—

"It should be remembered that systematists are far from being pleased at finding variability in important characters. . . . Authors sometimes argue in a circle when they state important organs never vary; for these same authors practically rank those parts as important (as some few naturalists have honestly confessed) which do not vary."

Dr. Robinson† expresses a similar view in different language :— "It is easy to see that species as now recorded in literature are by no means alike, and that they cannot be regarded as equivalents in any complete or logical system of classification. Curiously enough the term "species" seems to be growing more and more popular, as it means less and less.‡ Often and on all sides we hear lengthy arguments and emphatic asseverations to the effect that this or that plant is a 'perfectly good species,' and if in the course of monographic work a so-called species is let down to varietal rank, it rarely fails to find somewhere its ardent defenders, who appear to hold the curious view that the monographer has not merely expressed a scientific opinion, but has somehow perpetrated an injustice upon the plant or its describer."

It will soon be accepted as indisputable that "species must be subjected to a gradual reclassification along more definite lines. . . Each species must be examined in the light of vastly more

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* "On the necessity for a provisional nomenclature for those forms of life which cannot be at once arranged in a natural system." By H. M. Bernard. Abstract in *Proceedings*, Nov., 1900-June, 1901, p. 10.

† *Op. cit.*

‡ It will be observed for instance, in passing, that Mr. F. M. Bailey is very sparing in the use of varieties, making his named forms species instead.

copious material than at present exists even in our largest herbaria. . . . Let us, then, proceed with the accumulation of material, with the collection of specimens that may illustrate each species at every stage of development, in every part of its range, in every environment in which it occurs. In this matter we are much behind zoologists; they often work with hundreds, or even thousands of specimens, while we try to draw like inferences from dozens."

11. The Duty of Clearly Indicating Species.

Mr. J. J. Fletcher has shown* what sad confusion and waste of energy have arisen through failure on the part of the early zoologists to preserve records of their Australian types, and although Australian botanists are in a far better situation than their zoological confrères, there are many instances in which energy has been wasted in fruitless speculations in regard to types, which are of course the foundations on which systematic botany rests. Just as a building may come crashing down through a defect in its foundations, so may a large superstructure of observations be rendered useless and perhaps even mischievous because built upon a mistaken type. Further, everyone who describes a plant takes upon himself a responsibility to see that present and future generations may precisely understand the plant described. I refer to this important matter before this Society with the greater emphasis because I assert that the botanists who have contributed to our Journal during the last few years have kept this duty very clearly in mind. Dr. Robinson lays great stress on publishing the exsiccati-number of types. But in Australian herbaria the practice of cataloguing their contents is in its infancy. Herbaria in this continent only date from the time of Mueller, Australia being looked upon merely as a collecting ground for other (chiefly European) nations, and the idea of forming a herbarium in Australia never seemed to have

* *Report A.A.A.S.* (Melbourne, 1900), p. 69.

been thought of until the expiry of the first half of the nineteenth century. But the method of indicating a type is perhaps a detail; all that we should insist upon is that the author shall unmistakably indicate on his label his type, and, if necessary, afford access to it. He will save trouble in the latter respect by distributing specimens to some of the leading herbaria, with the word "type" indicated on the label. My own practice in the National Herbarium of New South Wales has been to mark a type by a label pasted on the specimen thus—

TYPE

and I have been punctilious about putting ample information on the label. We Australians know to our cost how difficult systematic work has sometimes been through the easy-going ways of systematists who have preceded us. So long as they were alive they could indicate their own types, or believed they could, but in some cases they have passed away without leaving a sufficiently clear record, and botanical anarchy is sometimes the result. This matter of looseness of description of new plants is ably dealt with by Prof. B. L. Robinson in a recent Presidential Address,* which renders unnecessary some similar remarks I had prepared. I will only say that ample field notes should be attached to the specimen wherever possible. Let them be really field notes, that is to say, written in the field with the tree or other specimen in view, and with the impressions sharp. It is surprising how soon one's memory fails, and what a mine of information there often is in a field note, in a brief expression or form of words written down by a collector with little or no idea of the full meaning of his words, afterwards to be read in the light of ampler knowledge.

I have, in a disjointed way I fear, set before you some of the results of recent botanical activity which are of special interest to us, and I have indicated some of the work that requires to be done. Every line of research completed does but open out a

* *Op. cit.* p. 763.

vista which stretches into the boundless infinity of what remains to be achieved.

> "I say that man was made to grow, not stop;
> That help, he needed once, and needs no more,
> Having grown but an inch by, is withdrawn:
> For he hath new deeds, and new helps to these.
> This imports solely, man should mount on each
> New height in view; the help whereby he mounts,
> The ladder-rung his foot has left; may fall,
> Since all things suffer change save God the Truth."
>
> Robert Browning, "A Death in the Desert."

In indicating, with such fulness, how vast are the fields of botanical science which remain untilled, I hope I shall not dishearten even the youngest member of our Society. Let the survey of the situation rather nerve us to fresh efforts, and let a stimulus be the memory of our noble-hearted founder whose beneficence to us should be recited at least every year at this annual gathering, as is the laudable practice of the University at its "commemoration" of benefactors.

Many of you can readily call to mind the happy, enthusiastic way in which Prof. Stephens, a former President, once uttered the words

Floreat Societas Linneana!

Perhaps there is a special appropriateness in that sincere wish for the welfare of our beloved Society being reiterated by a botanical President.

On the motion of Mr. R. H. Cambage a cordial vote of thanks was accorded to the President for his interesting Address.

The Hon. Treasurer presented the balance sheet for the year 1901, and moved its adoption, which was carried. The Society's income for the financial year ended December 31st, 1901, was £1,053 12s.; the expenditure £1,067 10s. 10d. (including one account for £17 12s. 6d. from 1900); with a credit balance of £45 7s. (including one cheque for £17 12s. 6d., not presented